Progress Report

May 4, 2016

Steam Enhanced Extraction at the Former Williams AFB, ST012 Site

Mesa, AZ

1. Summary

This report covers the period of operations from Tuesday, April 26, 2016 through Friday, April 29, 2016 when operations were concluded. The following table provides a summary of the project operational status.

Table 1. Project Summary

	Value	Unit
Target Treatment Zone (TTZ) Soil Volume	410,000	cubic yards (cy)
Area	199,000	square feet (ft^2)
Upper Depth of Treatment	145	feet (ft) below ground surface (bgs)
Lower Depth of Treatment	245	ft bgs
Vapor Liquid Treatment Started	09/29/14	
Thermal Operations Started	09/29/14	
Last Process Data Update	04/29/16	
Last Temperature Data Update	04/29/16	
Estimated Total Days of Operation	422	days
Days of Operation	578	days
Days of Operation vs. Estimate	137	percent (%)
Estimated Total Energy Usage	11,343,000	kilowatt hours (kWh)
Total Energy Used	6,025,716	kWh
Used Electrical Energy vs. Estimate	53	%
Total Steam Injected	302.4	million pounds (lbs)
Projected Total Steam Injection	320	million lbs
Steam Injected Vs Projected	94	%
Total Mass Removed in Vapor Based on Photoionization Detector (PID) Readings	1,257,290*	lbs
Total Mass Removed as NAPL	1,391,026	lbs
Average Daily NAPL Mass Removal Last Week	0	lbs/day
Total Vapor and Liquid Mass Removal (based on PID readings)	2,648,316	lbs
Average Power Usage Rate Last Week	439	kilowatts (kW)
Average Wellfield Vapor Extraction Rate Last	350	standard cubic feet per minute (scfm)
Average Condensate Production Rate Last Week	0.2	gallons per minute (gpm)
Average Water Extraction Rate Last Week	132	gpm
Total Water Extracted	95,827,197	gallons
Total Recovered Light Non-Aqueous Phase Liquid	211,724	gallons
Average Water Discharge Rate Last Week	151	gpm
Total Treated Water Discharge	126,079,000	gallons

Please note that no NAPL was transferred during this operational period and there was no NAPL accumulation since the last transfer on April 18, 2016.

Operational highlights from the past week include:

- Eductor skids were operated with six skids online until liquid extraction was shut down. The average liquid extraction rate from the formation was approximately 121 gpm during the operating period.
- Collected process, wellfield and laboratory samples per the sampling schedule.
- Conducted regular maintenance on the treatment system through shutdown.
- The vapor and liquid extraction systems were shut down on Friday, April 29, 2016.

*Includes adjustment of PID correction factor based on laboratory results through April 11, 2016. This decreases vapor mass removal reported for previous weeks which are included in the total vapor mass removal.

2. Vapor Extraction

Figure 1 below shows the vapor extraction rate from the site. Note that the estimated steam extraction rate is a calculated value based on the water generated at the moisture separators after cooling the vapors from the wellfield. Based on energy balance analysis, additional steam is likely being pulled into and condensing in the liquid extraction system. This steam extraction is not measureable and not accounted for in Figure 1. Additionally the wellfield flow is calculated as the difference between the air stripper flows and thermal accelerator influent, and is therefore only an estimate.

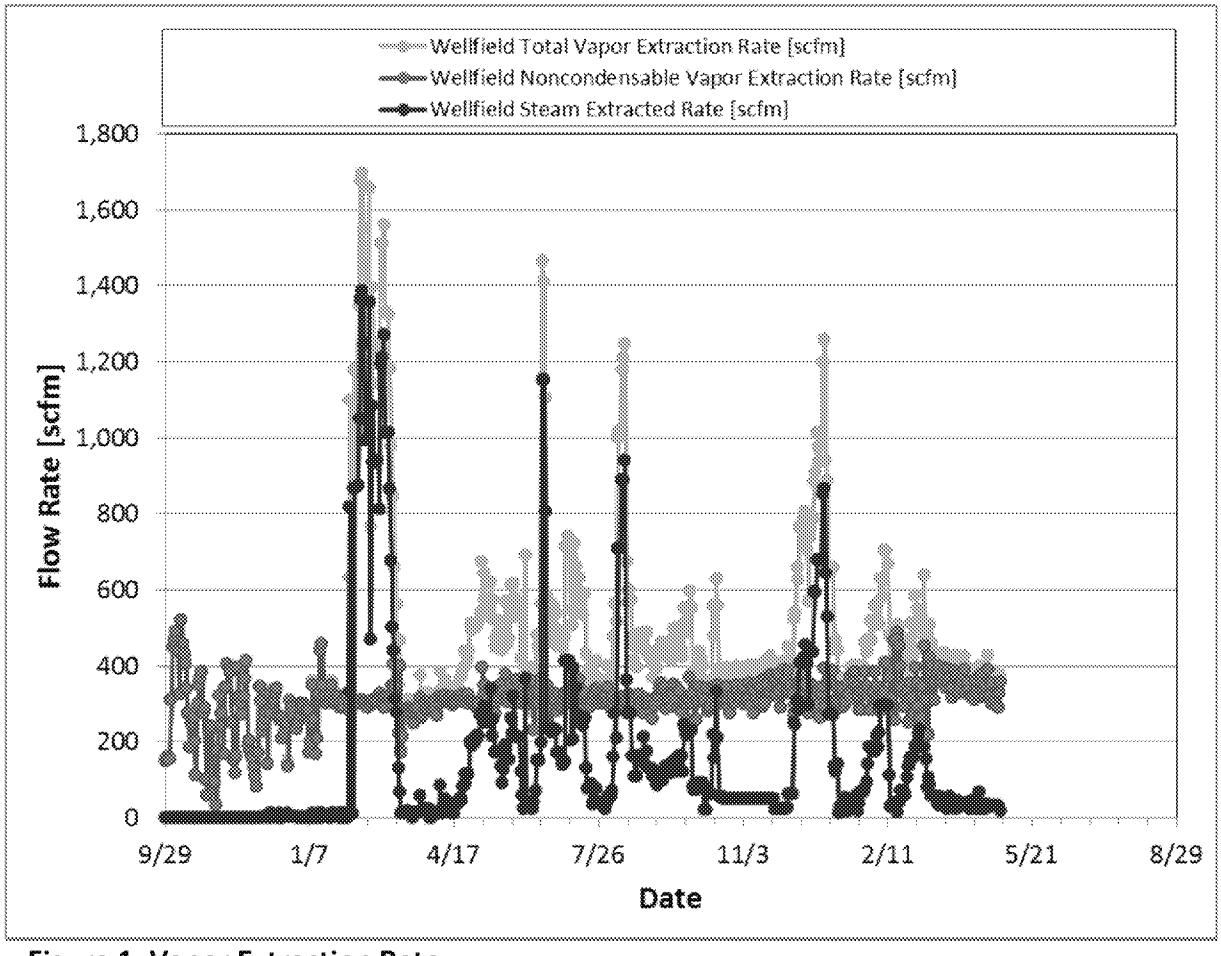

Figure 1. Vapor Extraction Rate

Note: Well SVE01M was tied into the SEE extraction system on June 5, 2015. Wells SVE10M and SVE14M were tied into the SEE extraction system on September 23, 2015.

3. PID Measurements

The following figure depicts the PID concentrations from the wellfield effluent to the effluent of the thermal accelerators collected since the start of operations. Note that PID readings of 0.0 parts per million by volume (ppmV) are shown in the figures as 0.01 ppmV due to the logarithmic scale that does not allow display of 0-values. Accelerator influent readings are interpolated for days where no data is collected, since the value is used in the mass removal calculation.

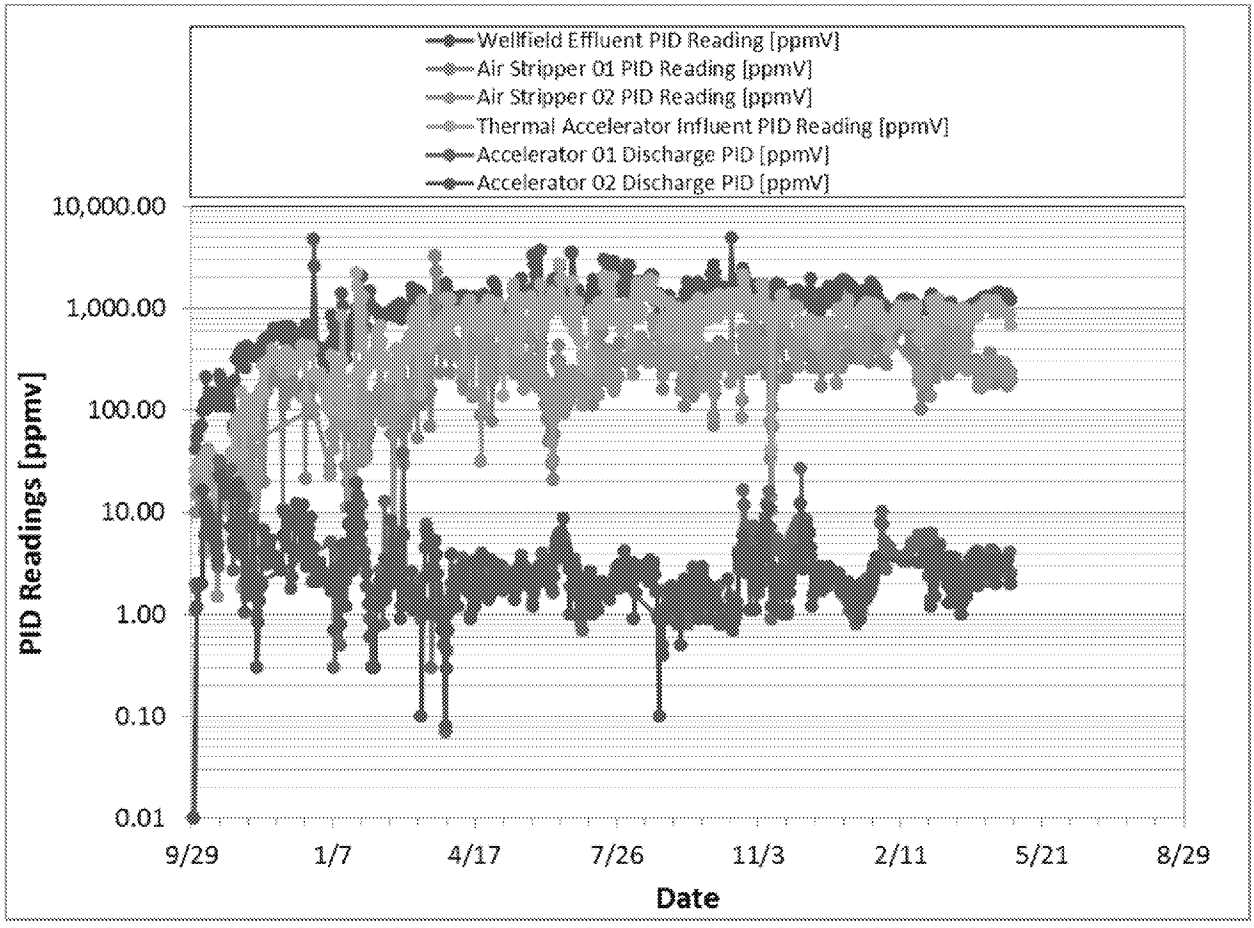

Figure 2. PID Readings

4. Mass Removal

The mass removal is calculated based on the PID and laboratory data collected at the thermal accelerator influent and the LNAPL recovered. The figure also depicts the mass removed based on PID and laboratory data.

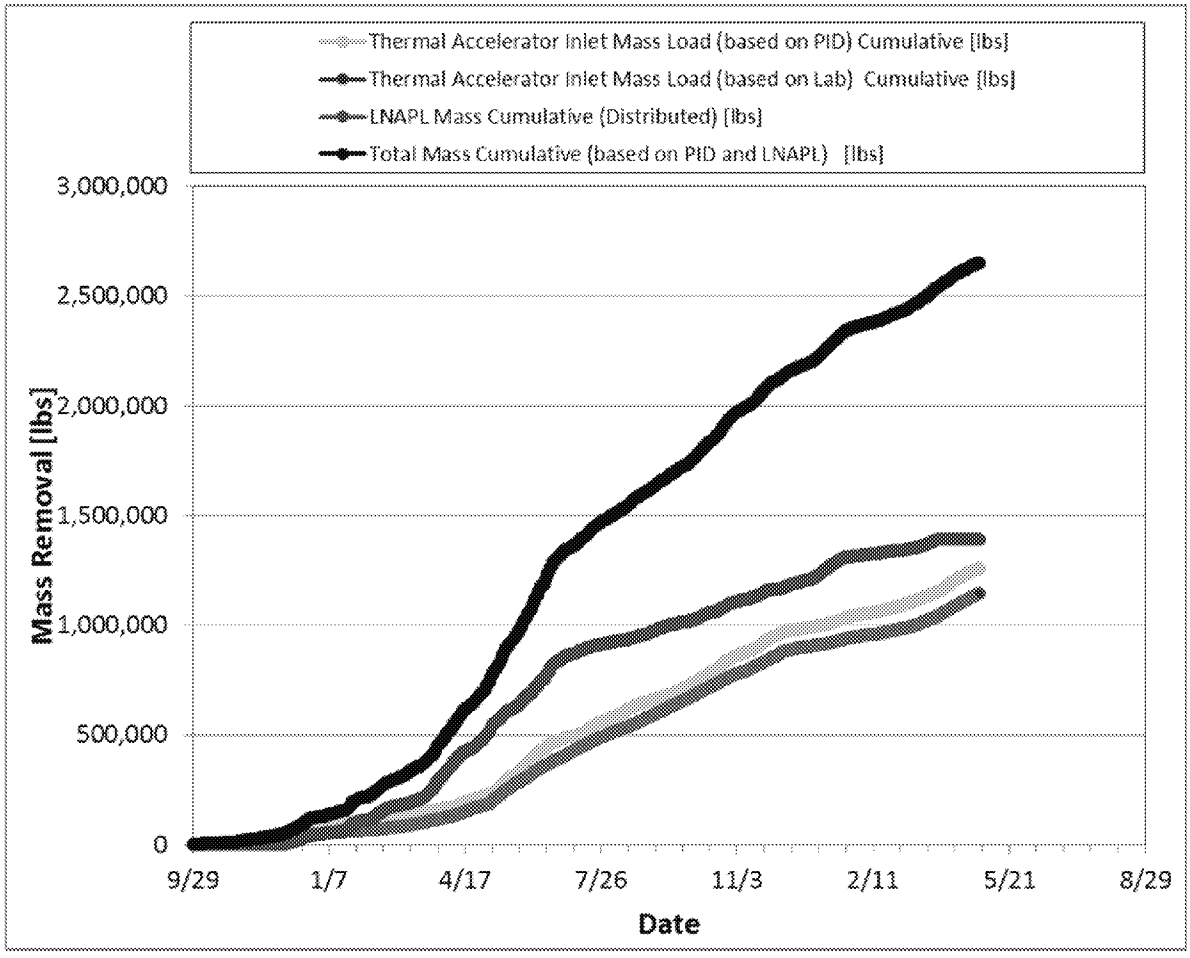

Figure 3. Mass Removal

Note: A NAPL density of 6.57 lbs/gallon is used to convert the NAPL volume to pounds. A molecular weight of 106.168 g/mol (corresponding to xylene) is used to convert PID readings to concentrations.

5. Daily Mass Removed

Figure 4 outlines the daily mass removed as vapor and LNAPL. The total daily mass removed is the combination of vapor and LNAPL. The liquid mass removal is captured in the vapor phase due to the volatilization of liquid contaminants in the air strippers.

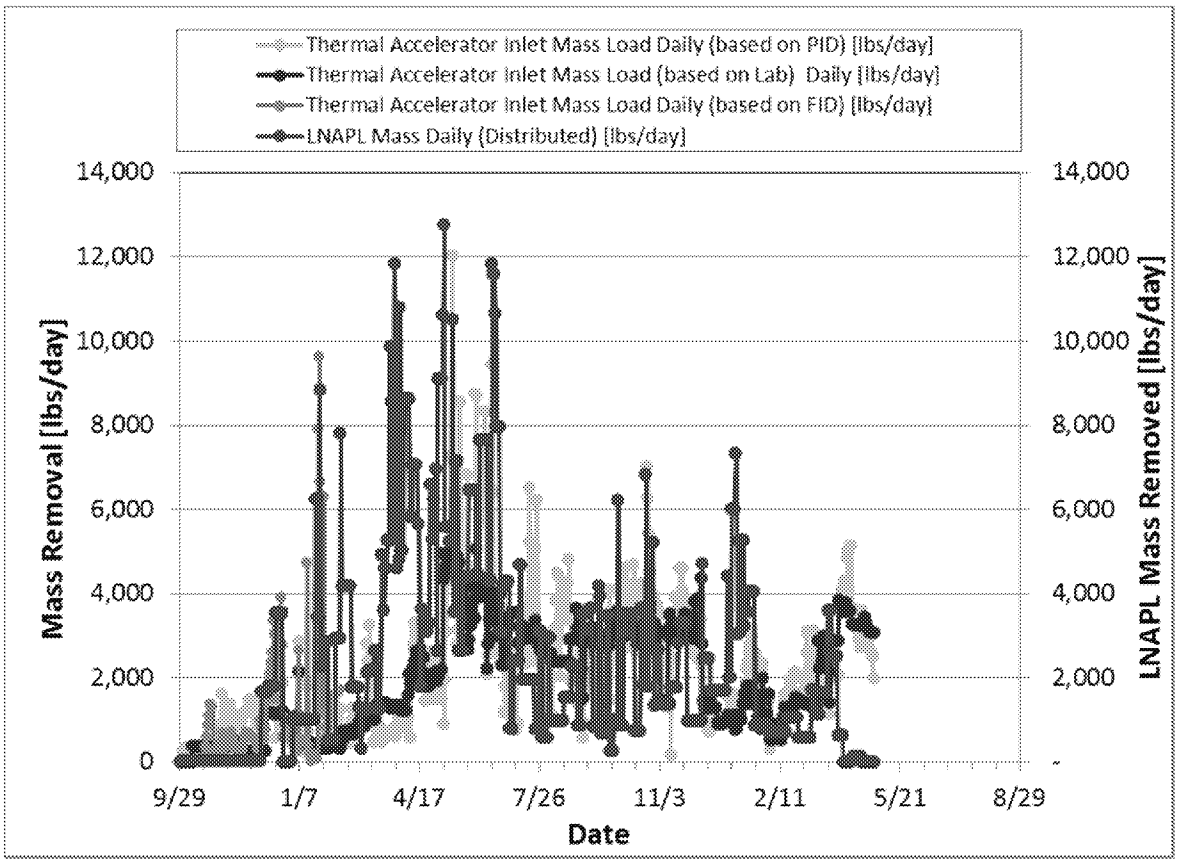

Figure 4. Daily Mass Removed

Note: Laboratory data are not collected daily. The "Thermal Accelerator Inlet Mass Load (based on lab)" is an average daily rate of actual laboratory data results received. The report has been updated based on laboratory data results received for samples collected through April 11, 2016 (please note that the February 11, 2016 correction factor looks to be biased low and is not thought to be a representative sample; it has not been used in the mass removal calculations).

Note that accumulated LNAPL is pumped through the NAPL conditioning system in a batch style process. The LNAPL daily mass removal rate has been calculated by calculating an average daily rate based on the total gallons processed for each batch over the number of days between batches. Last transfer included in the report was on April 18, 2016.

6. Power Usage

The cumulative power usage is shown below. All electricity used at the site is utilized to run the process system and steam generators.

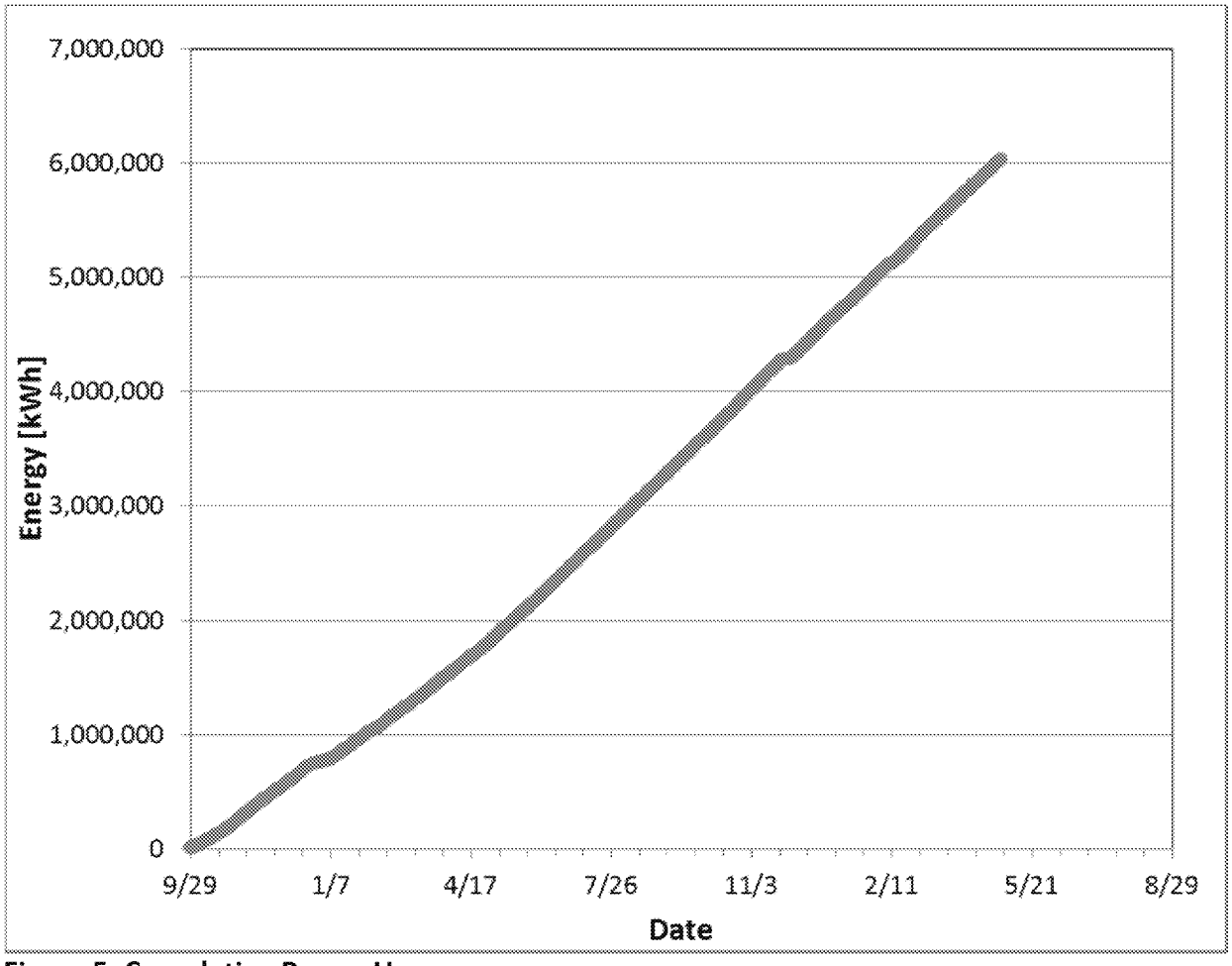

Figure 5. Cumulative Power Usage

7. Average Temperature

A detailed review of thermocouple sensor depths and temperatures over time was performed week ending November 13, 2015. Results of the review and updates are detailed below in Table 2 and Figure 6.

Table 2. Temperature Monitoring Sensor History

Temperature Monitoring Point	Temperature Monitoring Sensor History
TMP01	Well compromised 6/9/2015, select sensors back online 7/15/2015. Well not extended down in the Lower Permeable Zone (LPZ) and LSZ.
TMP03	Well compromised 12/18/15. All sensors offline as of 12/18/15.
TMP04	Well compromised 6/21/2015. Not included in LPZ and LSZ since 6/21/2015.
TMP05	Well compromised 5/6/2015, select sensors back online 7/15/2015. Sensors deeper than 160 ft have not been online since 5/6/2015 and therefore are not included in UWBZ, LPZ and LSZ.
TMP06	Well compromised 3/27/2015, select sensors back online 7/14/2015. Temperatures in the upper zone are suspicious.
TMP07	Well compromised 3/27/2015, select sensors back online 7/14/2015.
TMP08	Well partly compromised 9/11/2015 from 210 ft and down. The 215 and 235 ft sensors are still operating.
TMP09	Well compromised 2/9/2015 before CZ was turned on and UWBZ was up to temperature. The CZ and UWBZ temperatures have been excluded. LSZ temperatures have not been updated since 2/9/2015 (taken out of LSZ average).
TMP12	Sensors from 150 to 170 ft bgs only at ~50C. Brings down the average in CZ and UWBZ.
TMP13	Well compromised 3/27/2015, select sensors back online 4/30/2015. Since 7/1/2015 no sensor deeper than 225 ft has been operational. Temperatures in the upper zone are suspicious.
TMP15	Well compromised 8/15/2015. 8/15/2015 temperatures assumed from this day.
TMP17	Well compromised 3/27/2015, select sensors back online 6/12/2015 but not reporting properly, total failure 7/16/2015. Depths lower than 235 ft not included in average since well was not at temperature when sensors failed. 7/16/2015 temperatures applied to average since well failed.

The average soil temperatures as degrees Celsius (°C) and degrees Fahrenheit (°F) are shown in the figure below by treatment zone (i.e., LSZ, UWBZ and CZ).

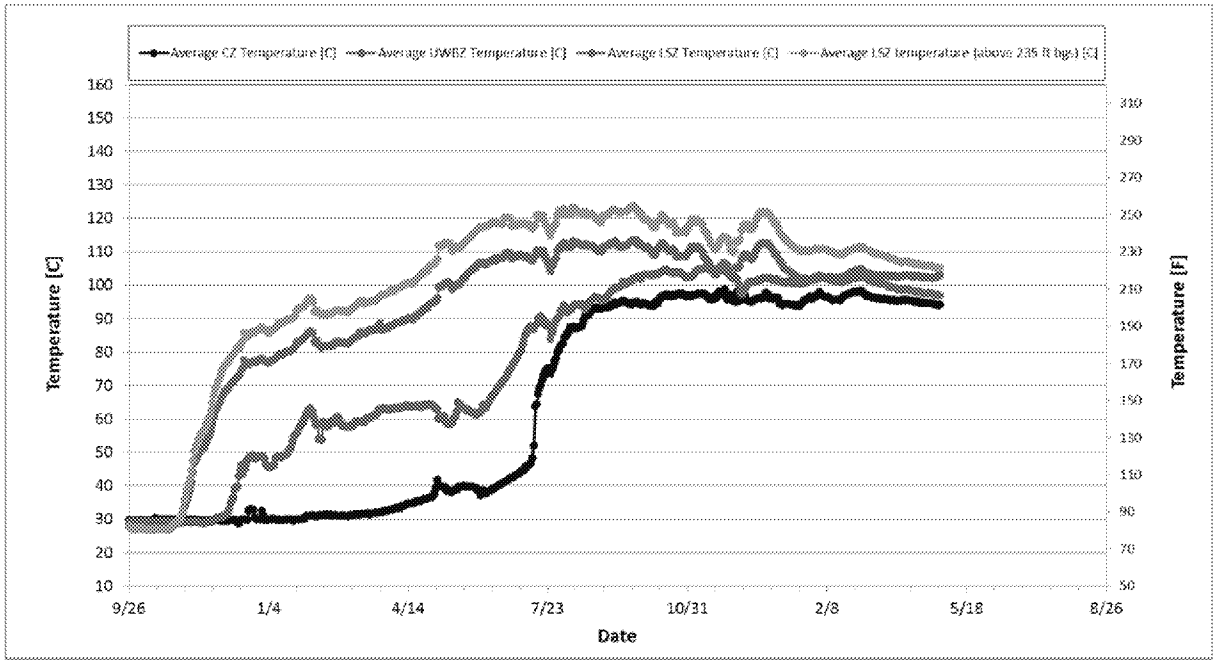

Figure 6. Average Soil Temperatures

Table 3 below provides a breakdown of the maximum average temperatures achieved at individual temperature monitoring points throughout SEE operations. The table below breaks down the average temperatures achieved across the CZ, UWBZ, Lower Permeability Zone (LPZ) and the LSZ to date. The LSZ is further broken down into the average for all LSZ sensors and those LSZ sensors above 235 ft bgs.

Table 3. Temperature Monitoring Point Maximum Depth-Averaged Temperature

	Temperature Monitoring Point Maximum Depth-Averaged Temperature[1] (°C) During SEE Operations by Zone				
Temperature Monitoring Point	**CZ**	**UWBZ**	**LPZ**	**LSZ**	**LSZ (depths above 235 ft bgs)**
TMP01	114.9	130.5	N/A	N/A	N/A
TMP03	N/A	N/A	137.5	114.2	120.7
TMP04	N/A	N/A	103.8	118.8	127.1
TMP05	110.3	N/A	N/A	N/A	N/A
TMP06	N/A	N/A	137.4	135.0	135.9
TMP07	N/A	N/A	134.6	137.2	140.2
TMP08	N/A	N/A	136.6	131.3	135.4
TMP09	N/A	N/A	132.5	134.1	139.3
TMP11	N/A	N/A	110.6	119.1	131.7
TMP12	78.7	95.6	121.8	121.4	131.3
TMP13	102.1	119.8	130.6	138.4	140.0
TMP14	N/A	N/A	133.6	124.3	136.3
TMP15	113.1	123.3	128.7	126.5	135.6
TMP16	N/A	N/A	126.7	120.5	131.0
TMP17	N/A	N/A	135.2	136.9	136.9
Maximum depth-averaged by zone[2]	**103.8**	**117.3**	**128.4**	**127.5**	**134.0**

If N/A, Temperature Monitoring Point has no sensors in that zone

[1] Temperature of the thermocouples across each depth zone are averaged for each TMP and each available time interval and then the maximum value of those averages throughout operations is listed in the table.

[2] Average of maximum depth-averages listed above for all TMPs in each zone.

8. Vertical and Horizontal Temperature Profiles

The following Figures 7 and 8 show the temperature in °C versus depth profiles for each of the 17 individual temperature monitoring points. Please see Table 2 for an updated temperature monitoring sensor status.

Temperature highlights for the reporting period include:

- Temperature decreases were observed at the 140 ft bgs and 160 ft bgs sensors at TMP 01.
- Slight temperature decreases were observed in the LSZ at perimeter well TMP 02.
- Temperature decreases were observed in all three treatment zones at perimeter well TMP 10.
- Slight temperature decreases were observed in all three treatment zones at TMP 11. The current high temperature for this well is 116°C at 210 and 215 ft bgs.
- Temperatures varied slightly across the majority of the arrays at TMP 12.
- Temperatures above and below the treatment zone decreased slightly.
- Temperature reductions were observed in all three treatment zones at TMP 14 and TMP 16.
- The majority of the TMPs either remained stable or saw very minor temperature reductions.

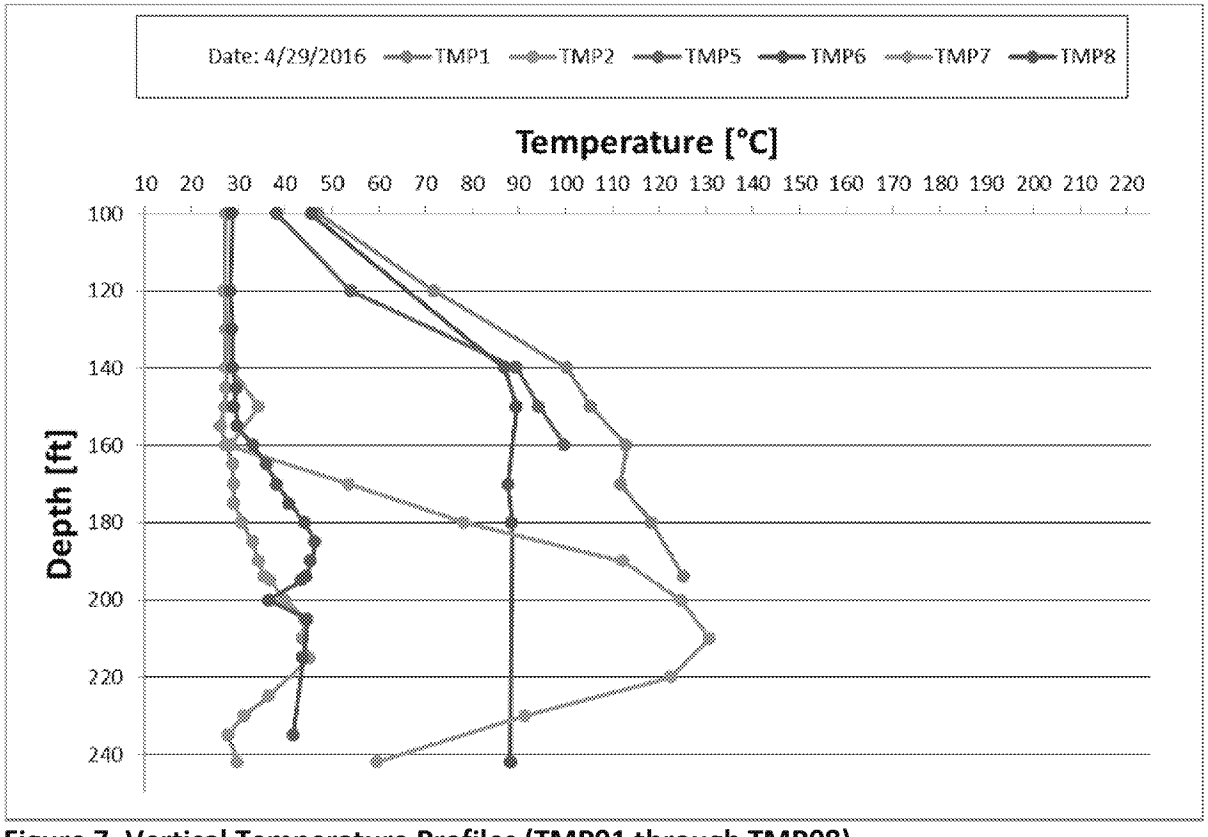

Figure 7. Vertical Temperature Profiles (TMP01 through TMP08)

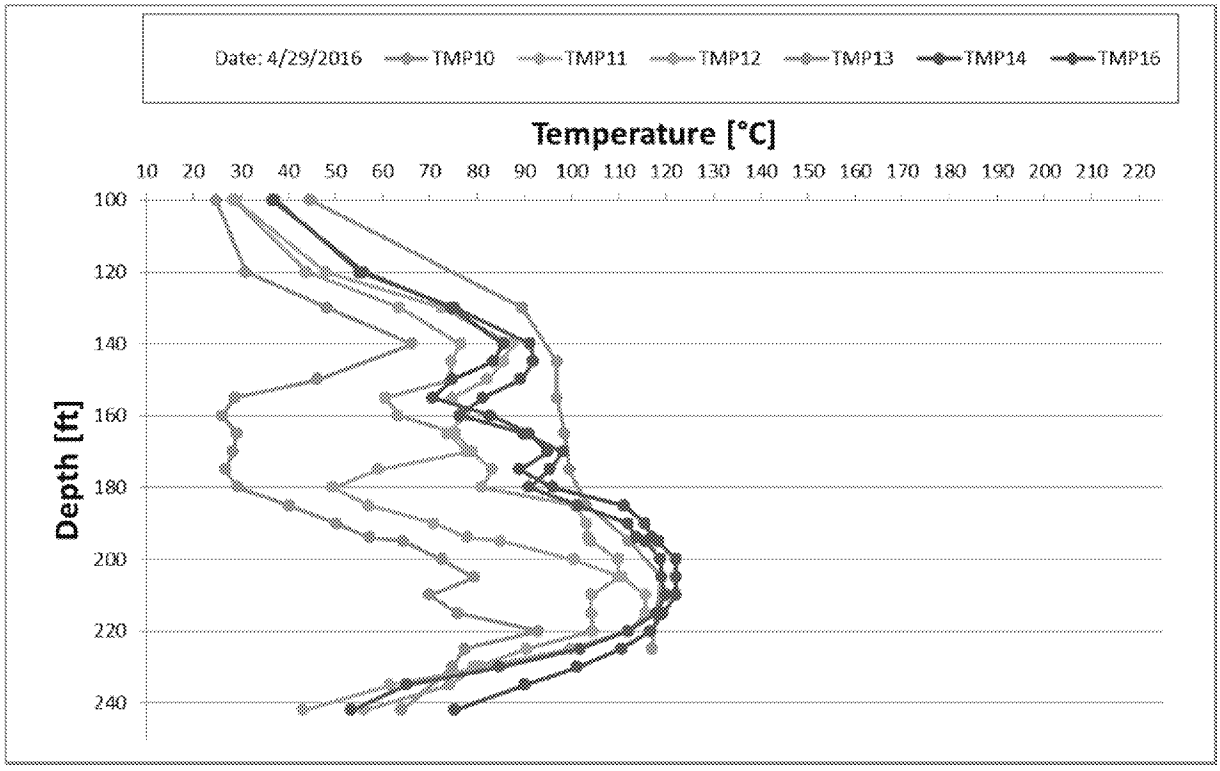

Figure 8. Vertical Temperature Profiles (TMP09 through TMP17)

Figures 9-12 show the horizontal temperature distribution across the site in four depth intervals.

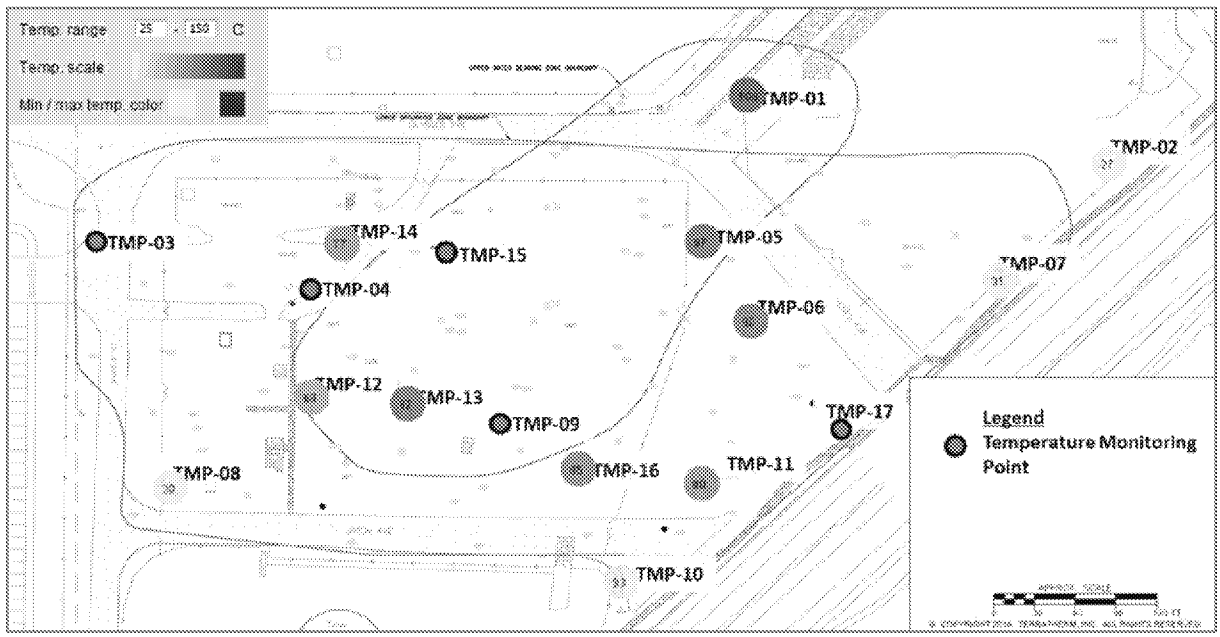

Figure 9. Horizontal Temperature Distribution across the CZ (145-160 ft bgs) (temperatures shown in °C)

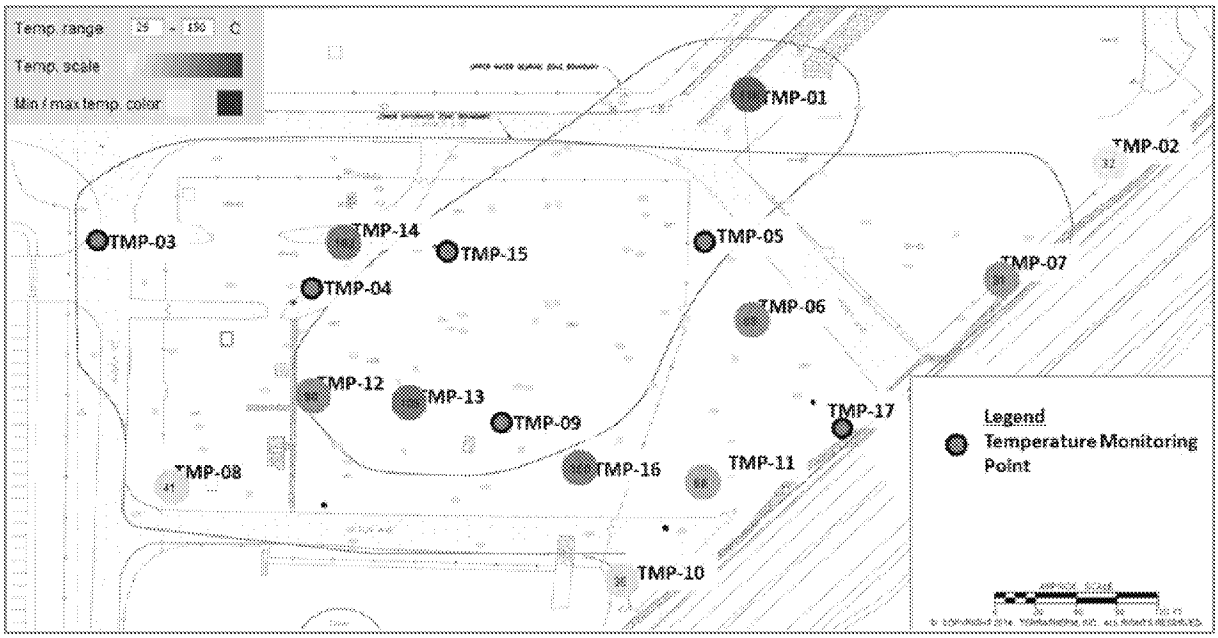

Figure 10. Horizontal Temperature Distribution across the UWBZ (161-195 ft bgs) (temperatures shown in °C)

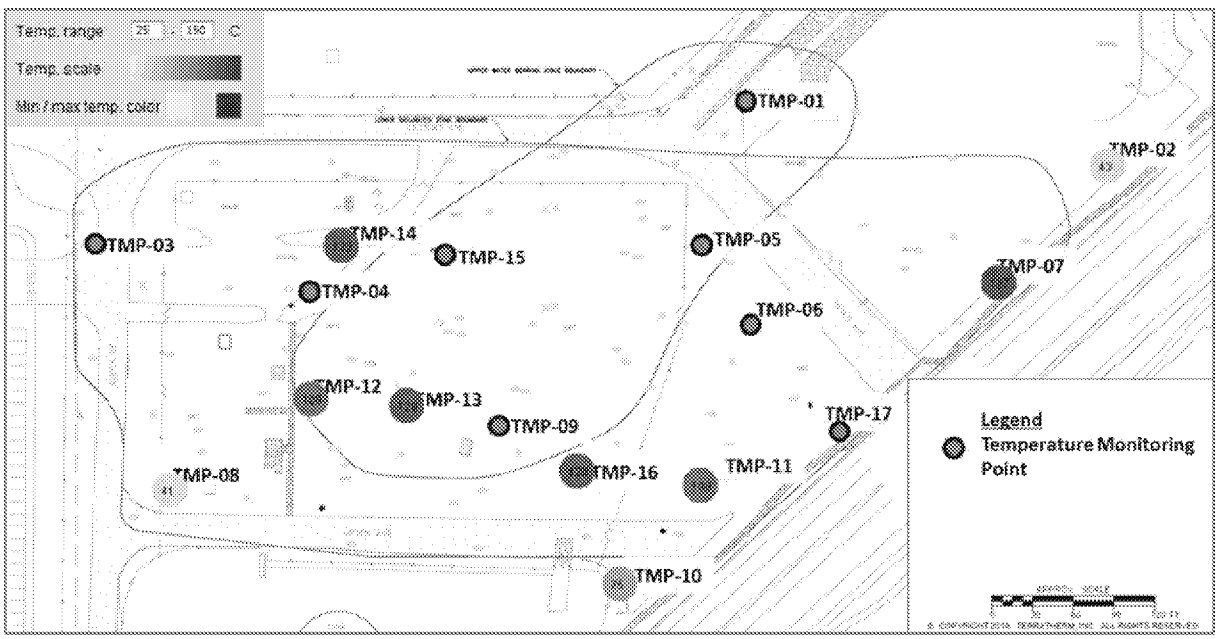

Figure 11. Horizontal Temperature Distribution across the Lower Permeable Zone (196-210 ft bgs) (temperatures shown in °C)

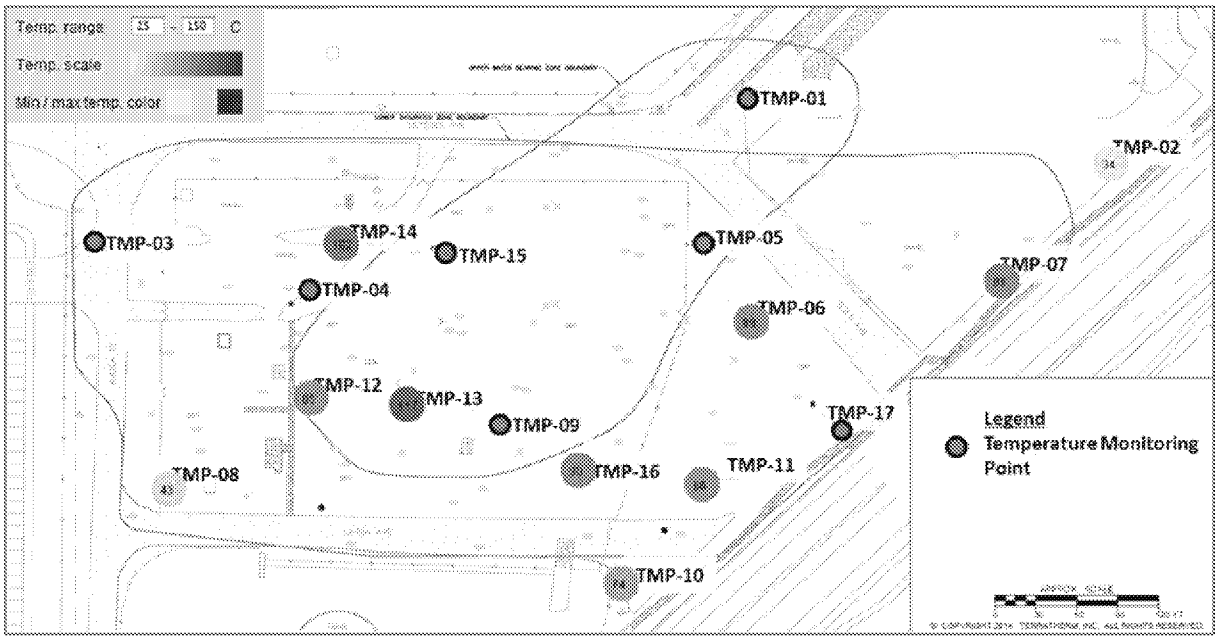

Figure 12. Horizontal Temperature Distribution across the LSZ (211-245 ft bgs) (temperatures shown in °C)

Figure 13 below shows the observed temperatures by depth at selected LSZ extraction wells.

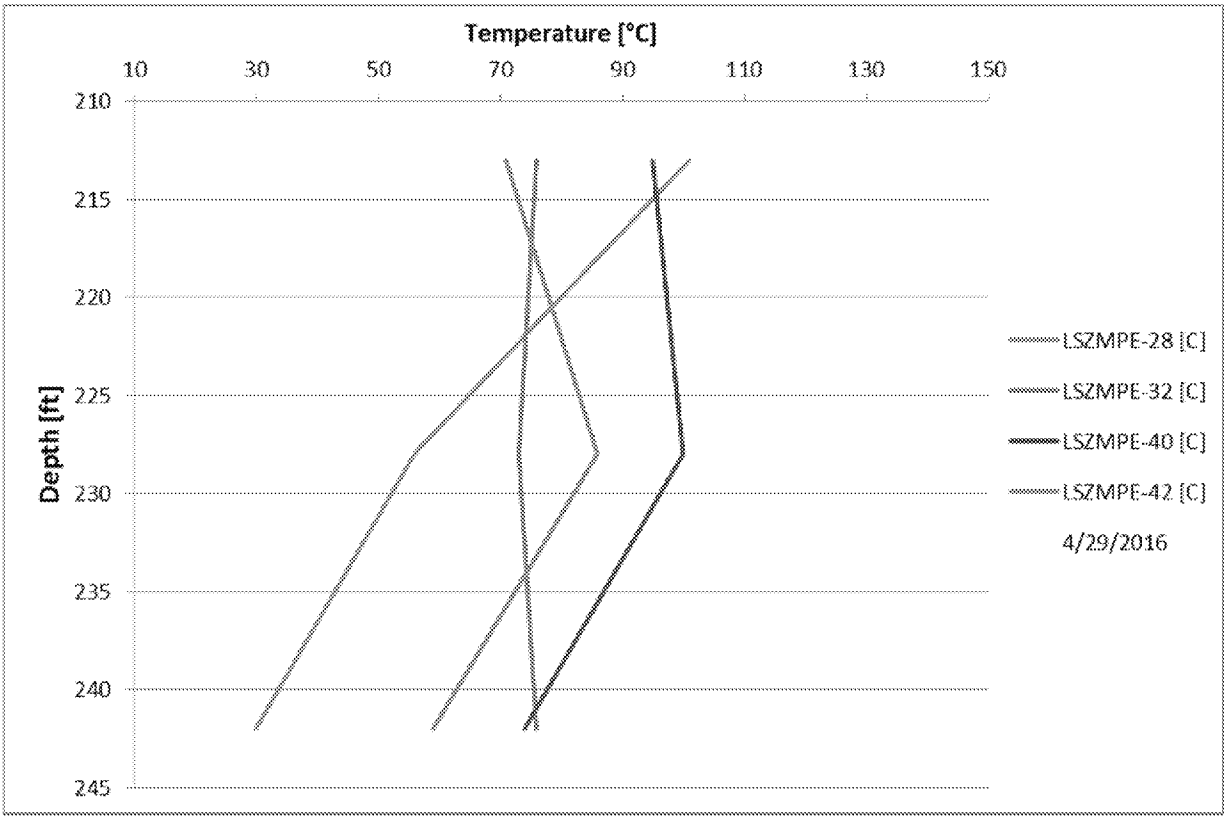

Figure 13. Temperatures by Depth at Selected LSZ Extraction Wells (211-245 ft bgs) (temperatures shown in °C)

9. Cumulative Steam Injection

Steam injection was initiated Thursday, October 16, 2014. Figure 14 below shows the cumulative steam injection for each of the three injection zones.

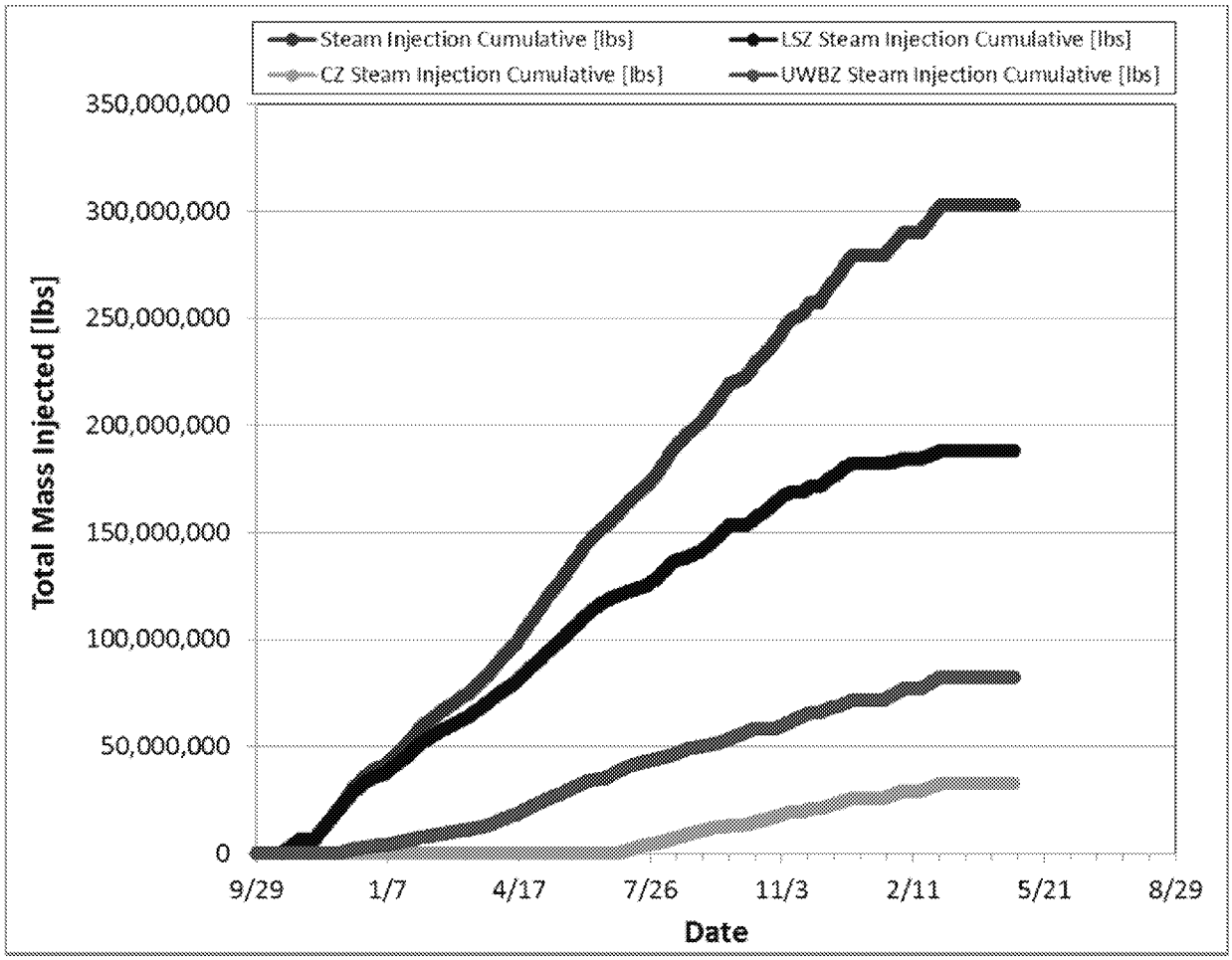

Figure 14. Cumulative Steam Injection for Each of the Three Injection Zones

10. Steam Injection Rates

The figure below shows the steam injection rates for each of the three injection zones.

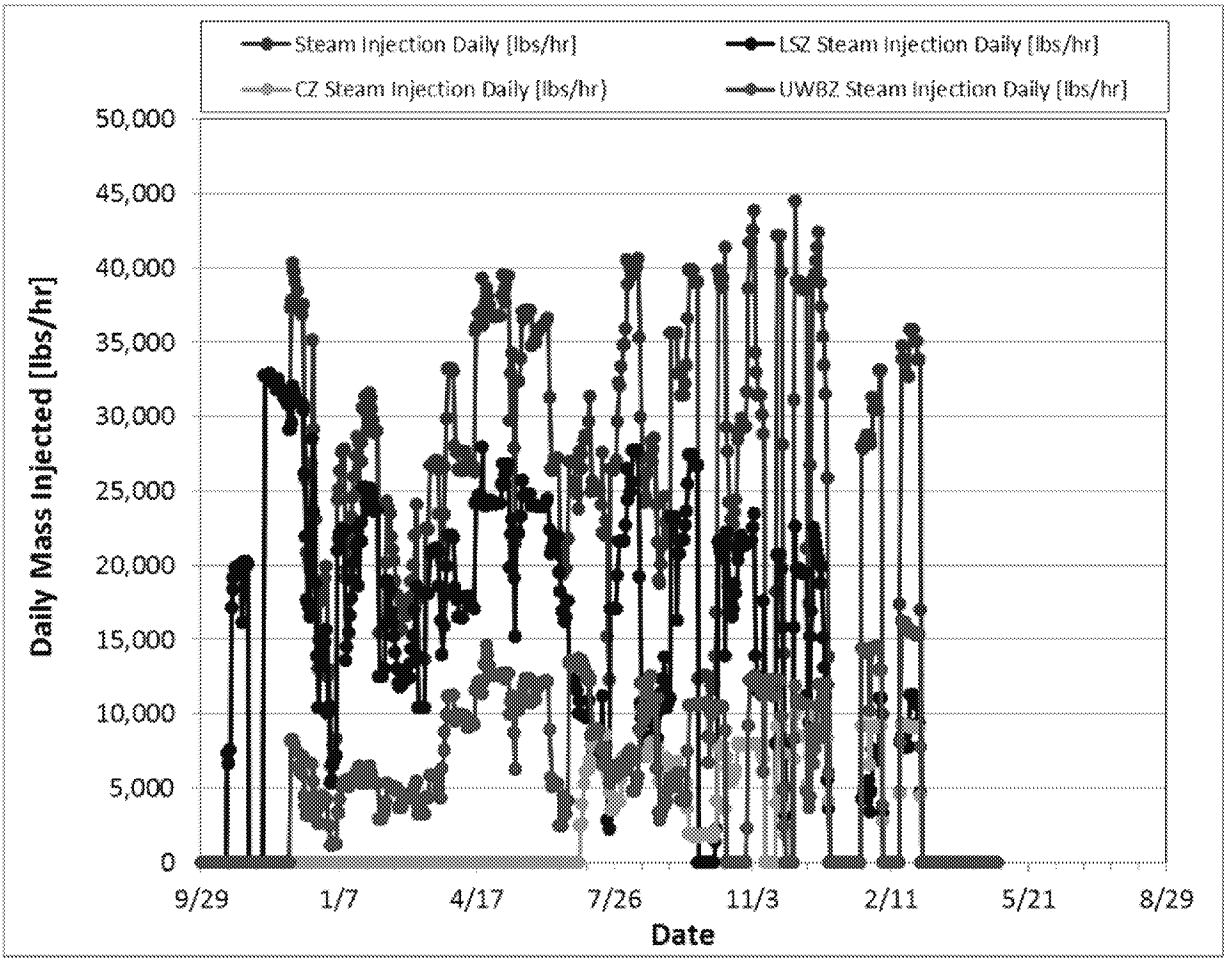

Figure 15. Steam Injection Rate for Each of the Three Injection Zones

11. Cumulative Water Extraction by Zone

The cumulative water extraction for each of the three treatment zones is shown below. The cumulative water extraction is calculated based on flow meters installed at each of the 57 extraction wells (accuracy should be considered +/- 20%). The figure below shows the net liquid extracted from the subsurface at the site and does not include the fraction of water that is recirculated to the eductor wells and used as motive water.

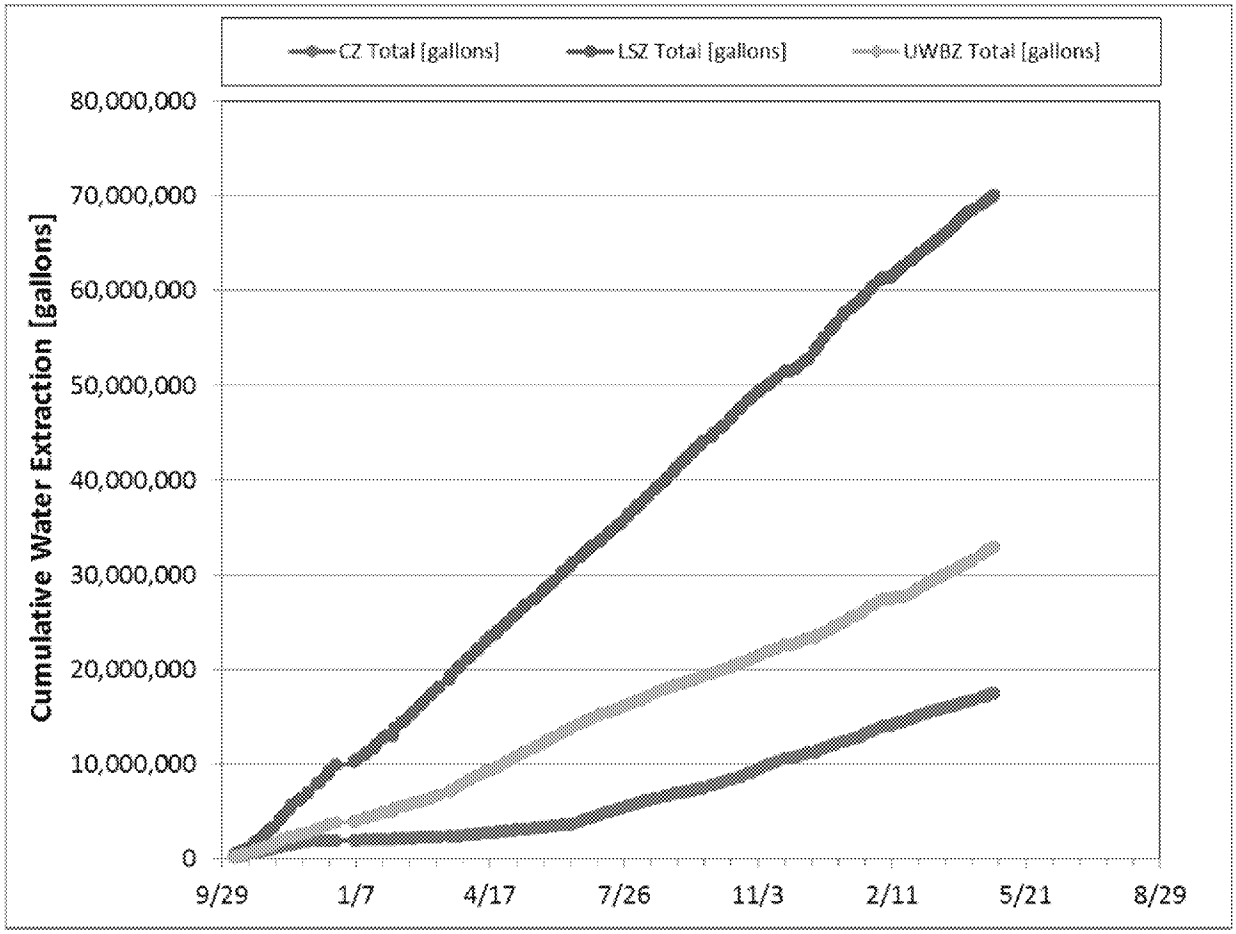

Figure 16. Cumulative Water Extraction for Each of the Three Treatment Zones

12. Water Extraction Rates by Zone

The figure below shows the water extraction rates for each of the three treatment zones.

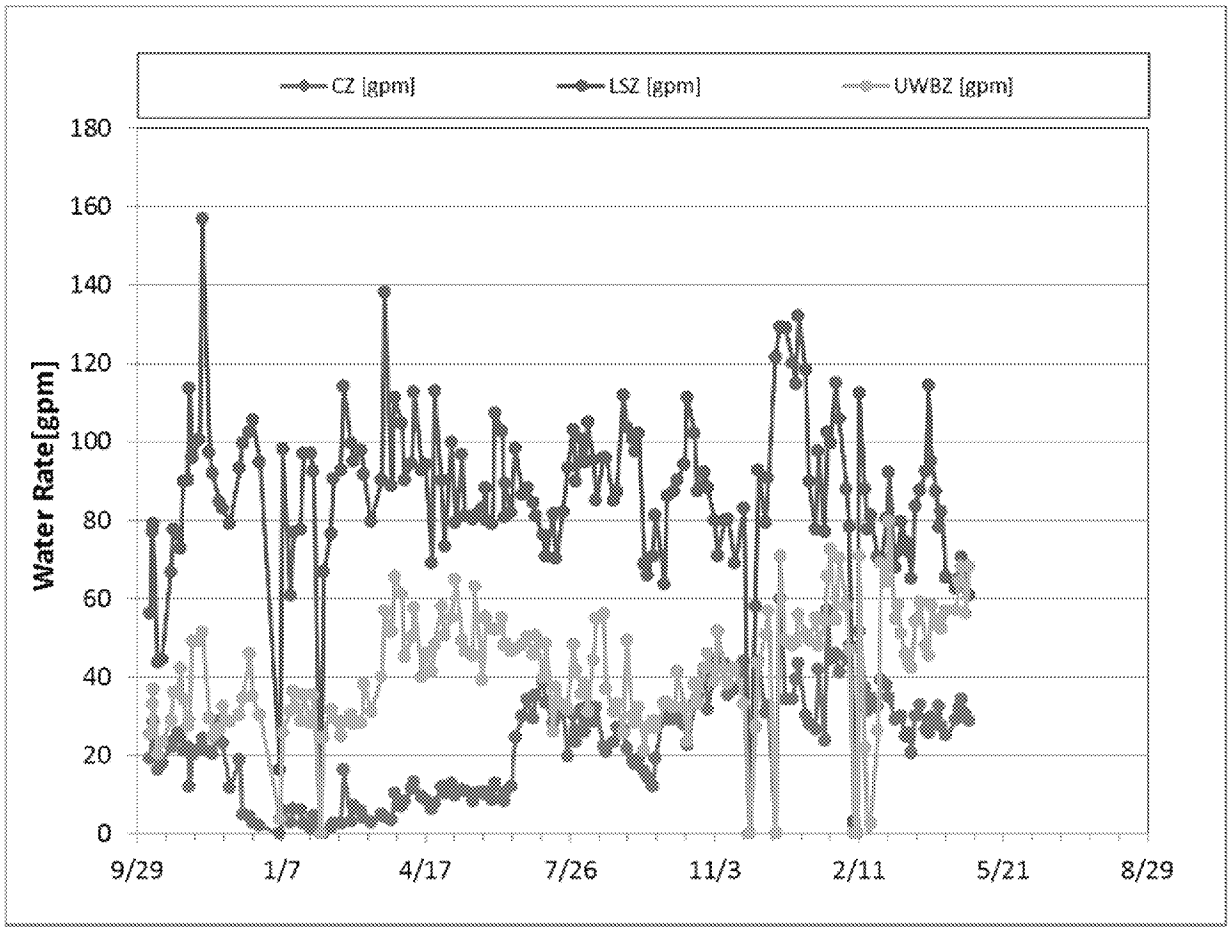

Figure 17. Water Extraction Rates for Each of the Three Treatment Zones

13. Cumulative Water Balance

The cumulative water balance for the site is shown below. The chart shows the net liquid extracted from the subsurface at the site and does not include the fraction of water that is recirculated to the eductor wells and used as motive water.

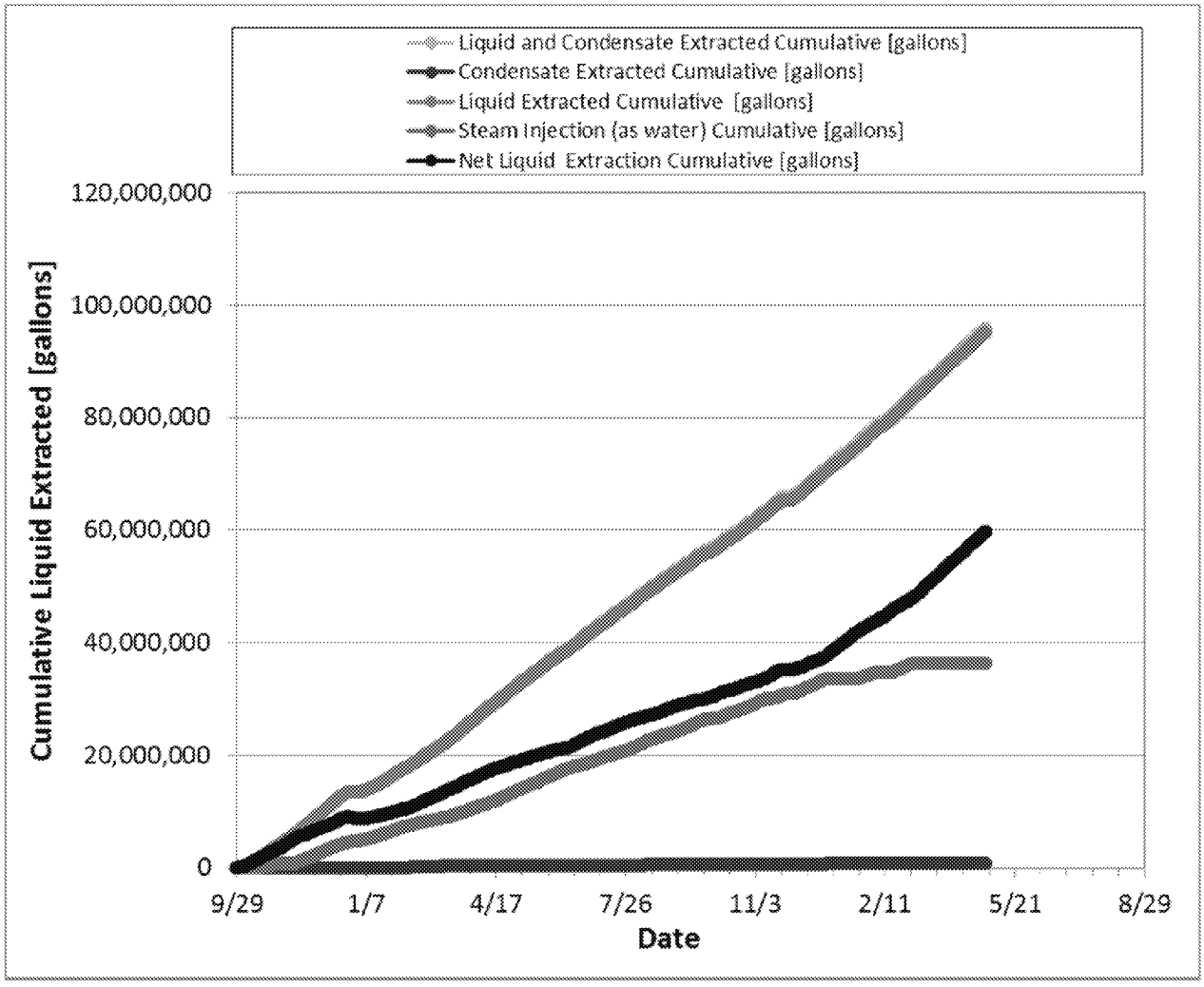

Figure 18. Cumulative Water Balance

14. Water Balance Rate

The total system water extraction rates are shown in the figure below.

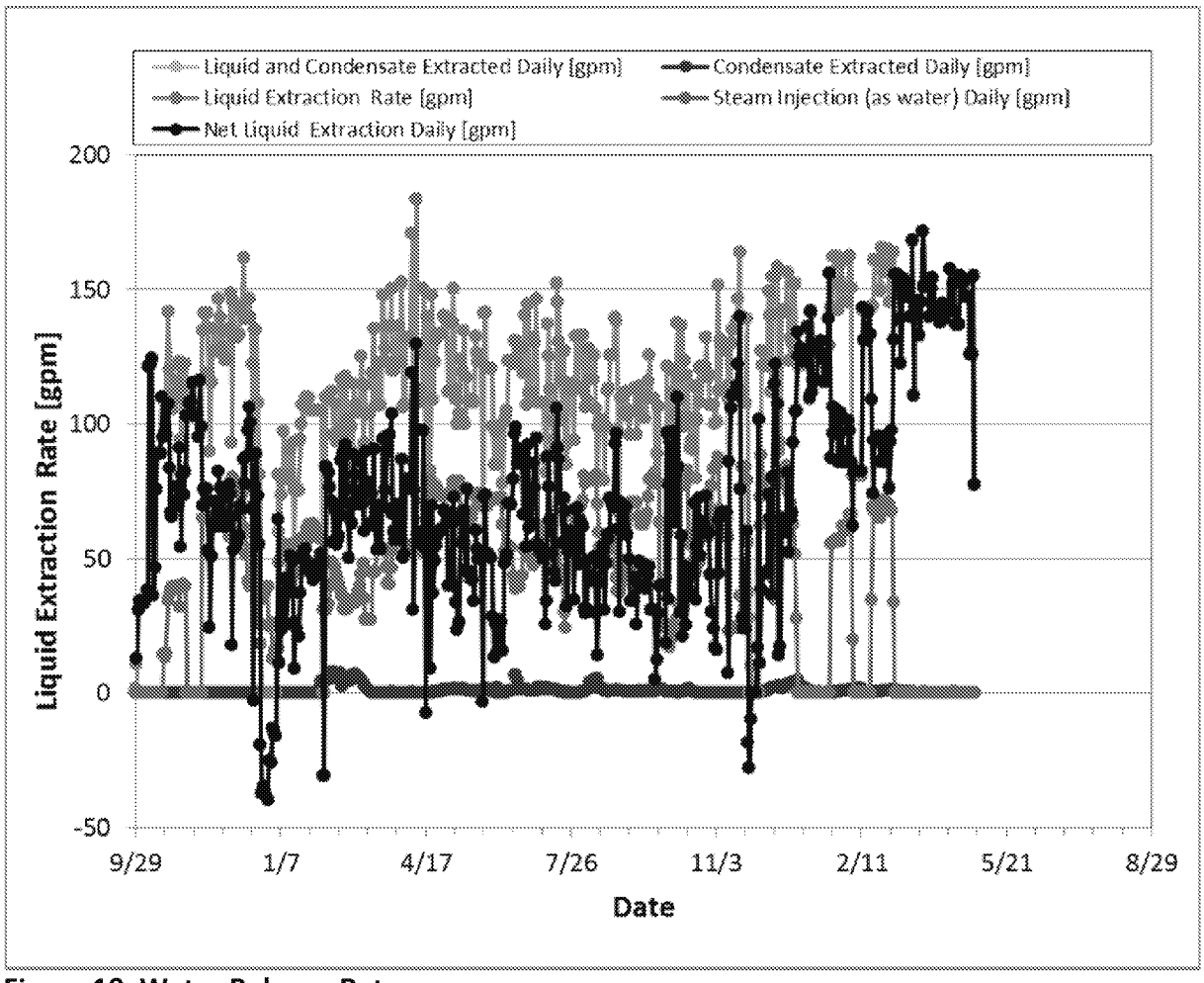

Figure 19. Water Balance Rates

15. Perimeter Water Level Data

Table 4 below presents the change in perimeter groundwater elevations since SEE system startup. The readings collected on September 24, 2014 (not shown) represent baseline conditions. A negative number shows that the groundwater elevation is lower than the baseline elevation, thus indicating an inward hydraulic gradient into the treatment zone. Liquid extraction began on September 29, 2014. Perimeter water level data are collected on a weekly basis. The regional groundwater table at the Site is increasing at a rate of approximately 1.5 ft/year; thus, each measured value shown in Table 4 has been corrected to take the regional changes into account.

Table 4. Perimeter Groundwater Elevation Changes

	4/8/2016		4/15/2016		4/22/2016		4/29/2016	
Monitoring Well	Change from Baseline	Change from Previous	Change from Baseline	Change from Previous	Change from Baseline	Change from Previous	Change from Baseline	Change from Previous
CZ/UWBZ Wells								
ST012-C01	-2.38	-0.03	-2.24	0.17	-2.49	-0.22	-2.59	-0.08
ST012-C02	-2.72	-0.14	-2.73	0.02	-2.92	-0.16	-3.04	-0.09
UWBZ Wells								
ST012-RB-3A	-6.60	-1.72	-4.12	2.51	-4.06	0.09	-3.91	0.18
ST012-U02	-4.44	-0.19	-3.86	0.61	-3.77	0.12	-3.65	0.15
ST012-U11	-4.93	0.58	-4.43	0.53	-4.75	-0.29	-4.75	0.03
ST012-U12	-6.83	0.44	-5.94	0.92	-5.64	0.33	-5.27	0.40
ST012-U37	-6.01	0.39	-5.29	0.75	-4.98	0.34	-4.69	0.32
ST012-U38	-3.64	-0.01	-3.28	0.39	-3.27	0.04	-3.24	0.06
LSZ Wells								
ST012-W11	-6.67	0.44	-4.89	1.81	-5.99	-1.07	-4.49	1.53
ST012-W12	-6.25	0.46	-4.68	1.60	-5.49	-0.78	-4.25	1.27
ST012-W24	-5.50	0.30	-4.27	1.26	-4.97	-0.67	-1.73	3.27
ST012-W30	-6.15	0.46	-4.87	1.31	-5.29	-0.40	-4.49	0.83
ST012-W34	-5.19	0.25	-4.08	1.14	-4.70	-0.59	-5.90	-1.17
ST012-W36	-5.29	0.27	-3.80	1.52	-4.67	-0.84	-3.43	1.27
ST012-W37	-7.30	0.44	-5.25	1.93	-6.91	0.45	-5.09	1.72
ST012-W38	-4.77	0.20	-3.95	0.85	-4.33	-0.35	-3.67	0.69

Figure 20 shows the manually collected groundwater elevation trends since system startup. Additionally Figure 21 shows the groundwater elevations continuously logged in selected perimeter wells equipped with transducers. The regional groundwater table correction has also been applied to Figure 20 below.

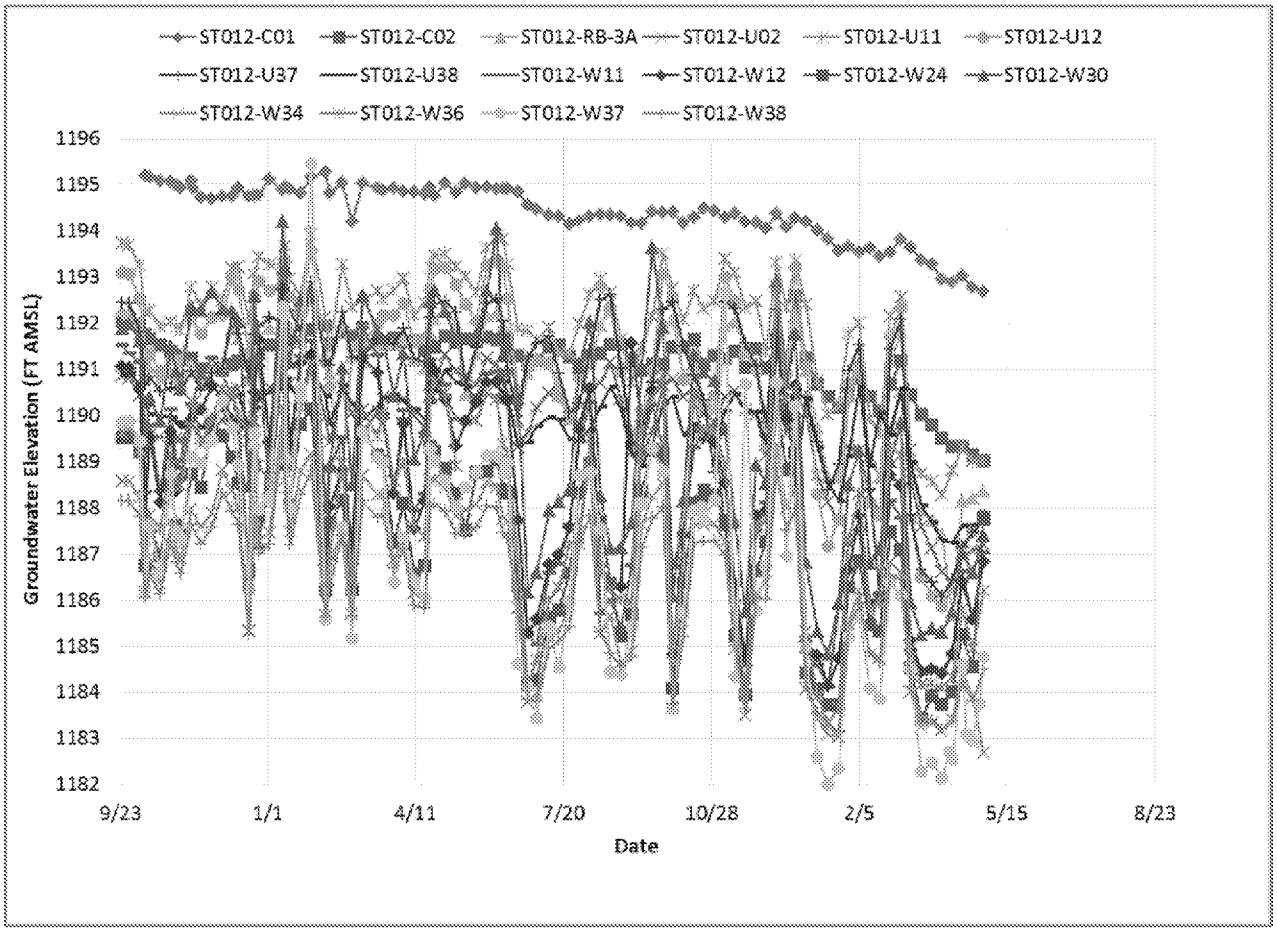

Figure 20. Manually Collected Perimeter Groundwater Elevations

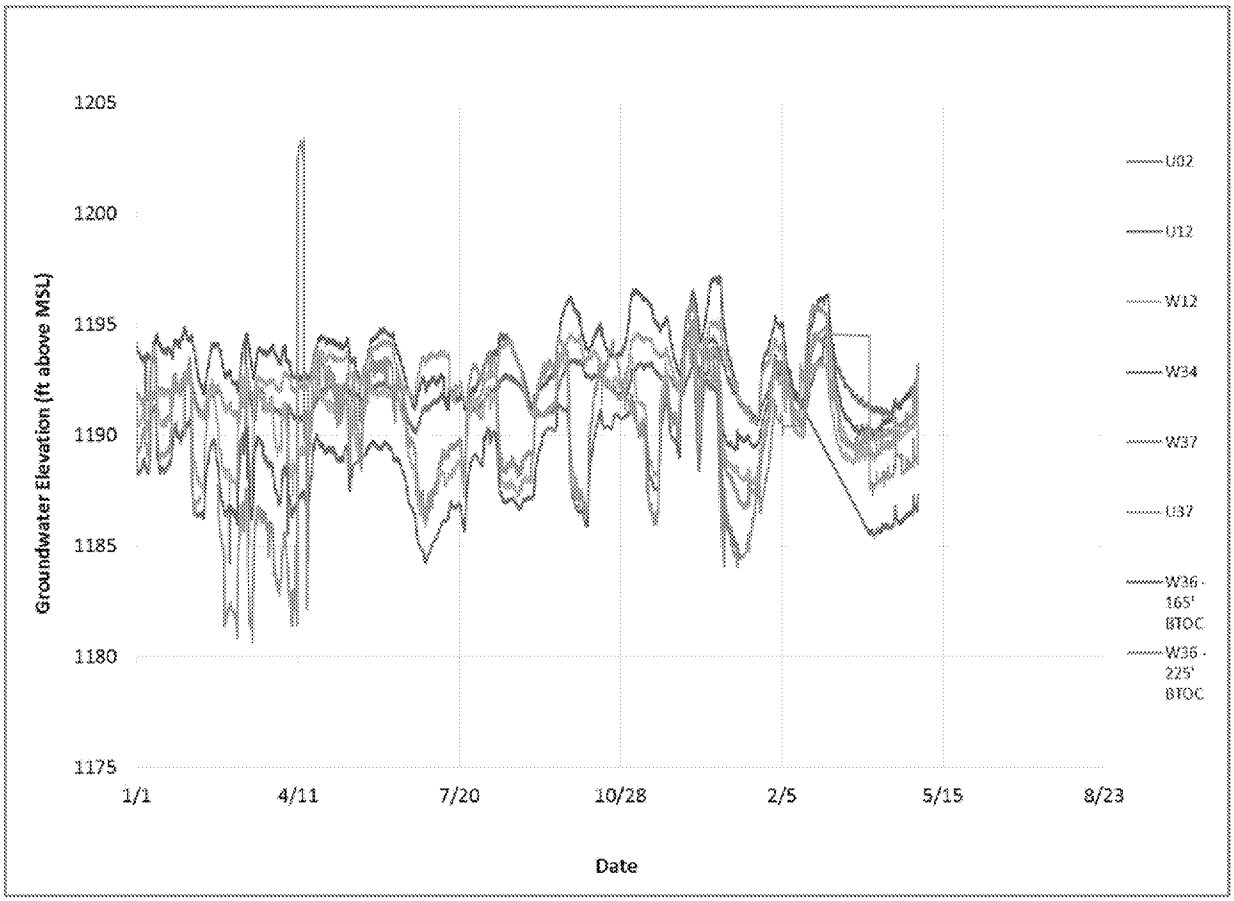

Figure 21. Automatically Collected Perimeter Groundwater Elevations

Table 5 below presents the measured LNAPL thicknesses of the perimeter wells at the site. Perimeter LNAPL thickness data are collected on a weekly basis.

Table 5. Perimeter LNAPL Thicknesses (ft)

Monitoring Well	4/8/2016			4/15/2016			4/22/2016			4/29/2016		
CZ/UWBZ Wells	Before bailing/ pumping	After Bailing/ pumping	Weekly Gallons Removed	Before bailing/ pumping	After Bailing/ pumping	Weekly Gallons Removed	Before bailing/ pumping	After Bailing/ pumping	Weekly Gallons Removed	Before bailing/ pumping	After Bailing/ pumping	Weekly Gallons Removed
ST012-C01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-C02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UWBZ Wells												
ST012-U02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-U38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-RB-3A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LSZ Wells												
ST012-W11	5.52	5.52	0.00	5.76	5.76	0.00	5.68	5.68	0.00	5.90	5.90	0.00
ST012-W12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ST012-W37	14.74	9.85	3.19	12.66	12.66	0.00	20.60	1.60	12.40	18.07	3.88	9.26
ST012-W38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes:

[1]Estimated gallons removed based on 4-inch casing and difference in product level in well before and after removal. Does not account for volume of hose or other equipment in the column of product. Includess all dates bailed/pumped in the week.

[2]In addition to the weekly measurements, ST012-W37 LNAPL levels were measured and LNAPL was pumped on 2/10/16 and 2/15/16

On December 1, 2014, temperatures at selected perimeter wells were added to the monitoring program. Figure 22 below shows the manually collected temperatures recorded at the wells included in the monitoring program. Additionally, Figure 23 shows the temperatures continuously logged in selected perimeter wells equipped with transducers.

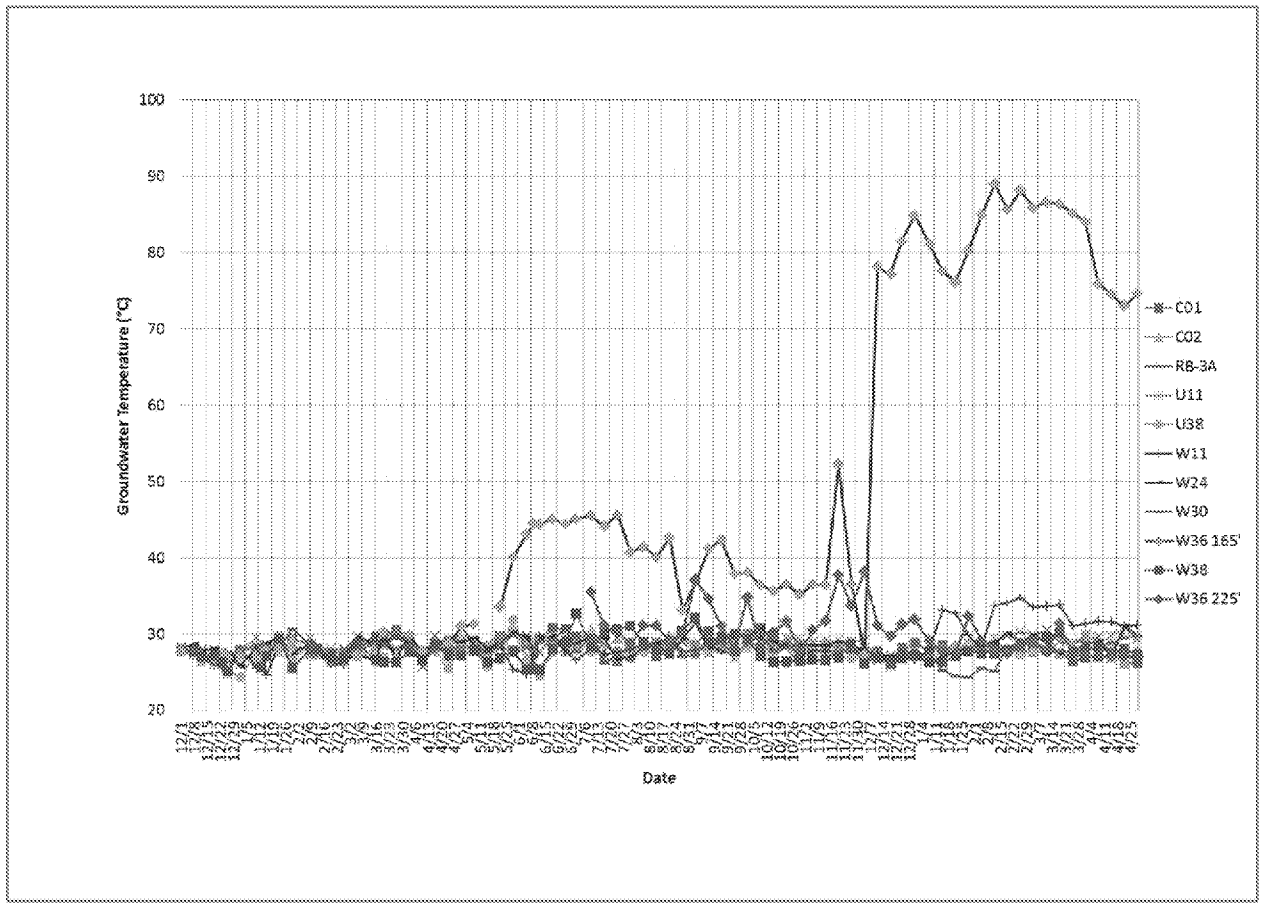

Figure 22. Manually Collected Perimeter Well Groundwater Temperatures

Note: Thermocouples are measured at approximate depths as follows (in feet below top of casing): C01=162; C02=168; RB-3A=161; U11=180; U38=164; W11=228; W24=230; W30=231; W36=225; and W38=228.

As a response to the increased temperatures observed at W36 on December 12, 2015 steam at nearby UWBZ9 and UWBZ25 were decreased.

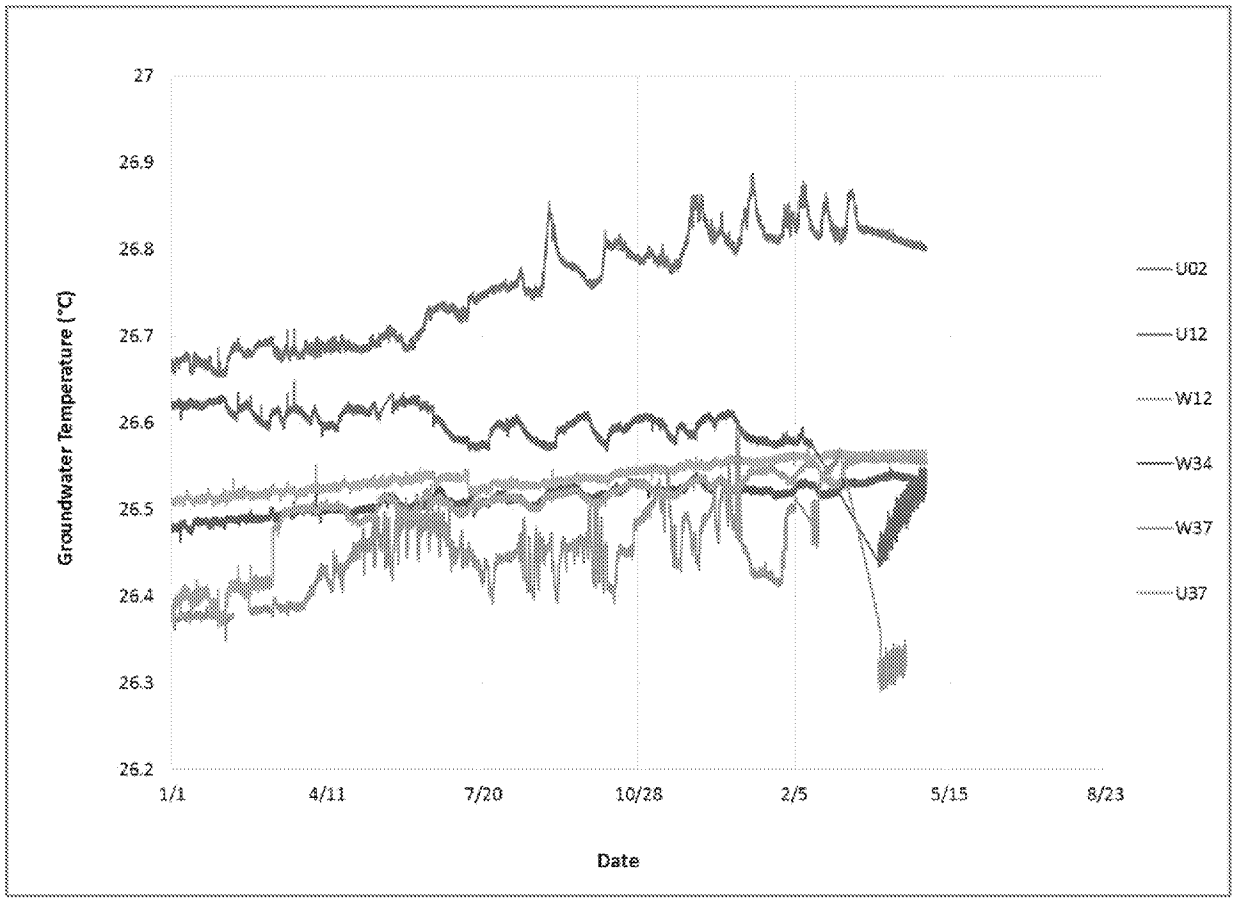

Figure 23. Automatically Collected Perimeter Well Groundwater Temperatures

Notes:
On March 7, 2015 operational personnel replaced the U37 logger unit. The increase in temperature on March 7, 2015 at U37 is a result of this replacement. Transducers in W34 and W37 were reinstalled on March 30, 2016.

Transducers are measured at depths as follows (in feet below top of casing): U02= 175; U12= 175; U37= 182; W12= 228; W34= 225; and W37= 226.

16. Natural Gas Usage

The following figure shows the natural gas usage rate in cubic feet per hour (cf/hr) and cumulative natural gas use in cubic feet (cf) to date at the site.

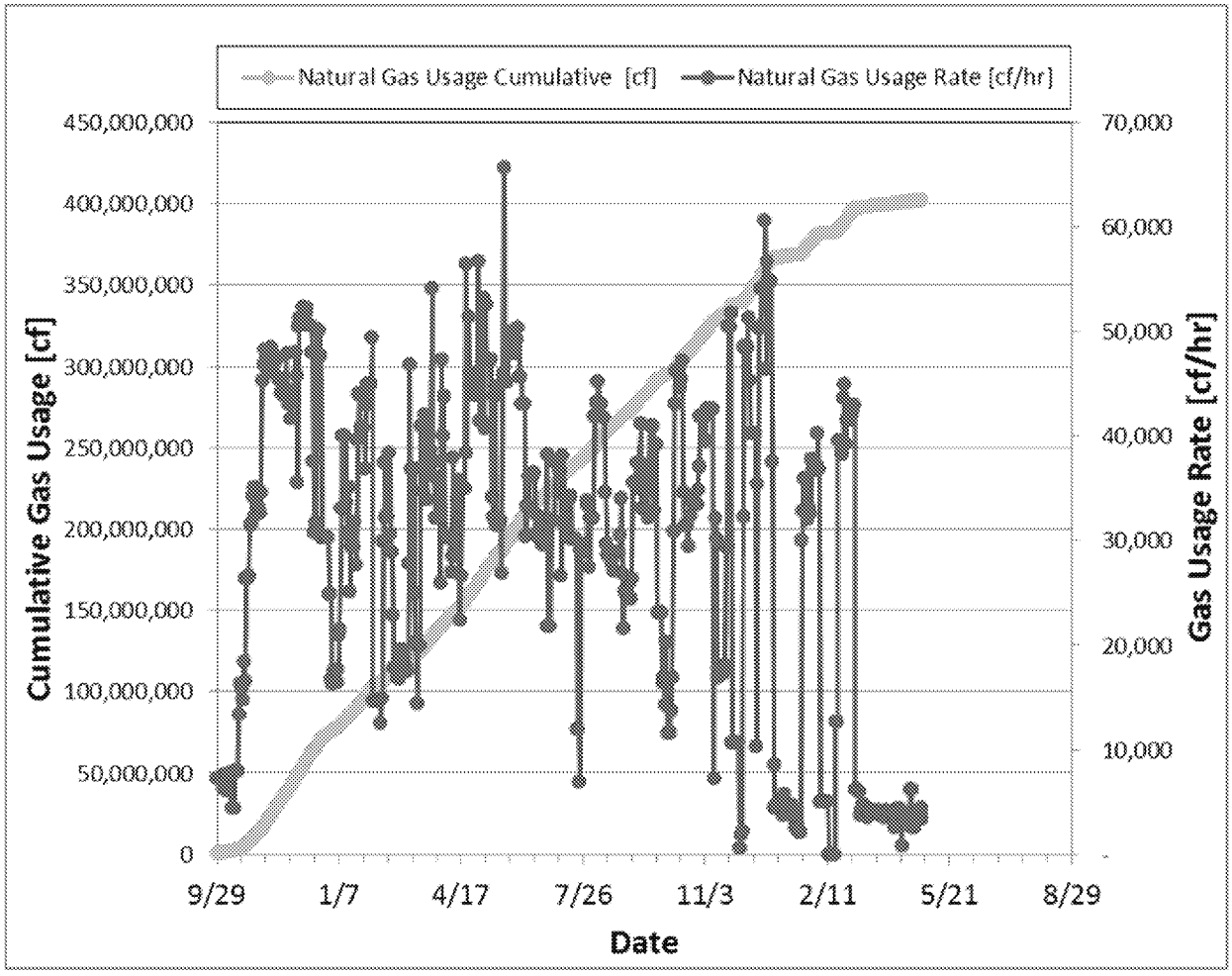

Figure 24. Natural Gas Usage

17. Waste Generation

On January 19, 2015 a total of 8,033 gallons of material from tank cleanout activities was removed from the site by Mesa Oil for recycling. The mass of JP-4 in the material was estimated to be 2,857 gallons or 18,800 lbs.

On February 18 and 19, 2015 a total of 24,430 gallons of material from tank cleanout activities was removed from the site by Mesa Oil for recycling. The mass of JP-4 in the material was estimated to be 3,645 gallons or 23,984 lbs.

On March 12, 2015 a total of 11,359 gallons of predominantly water from tank cleanout activities was removed from the site by Mesa Oil for recycling. The JP-4 mass in the water was limited.

On March 20, 2015 the first shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On March 30 and 31, 2015 a total of 32,000 lbs of spent liquid carbon was removed from the site by Evoqua Water Technologies for regeneration at their Red Bluff, CA facility.

On April 24, 2015 a shipment of bag filters (three cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On May 29, 2015 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On June 11, 2015 three 55-gallon drums of soil dug from around the Hypro NAPL filter were shipped offsite for non-hazardous disposal.

On June 10, 2015 a total of 5,727 gallons of oily bio-impacted water from tank cleanout activities was removed from the site by Mesa Oil for recycling.

On June 25, 2015 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On August 19, 2015 a total of 16,000 lbs of spent liquid carbon was removed from the site by Evoqua Water Technologies for regeneration at their Red Bluff, CA facility.

On August 27, 2015 a total of five totes with approximately 250 gallons each of water/solids from disinfection of the liquid carbon vessel were removed from the site by MP Environmental for disposal.

On October 22, 2015 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On November 23, 2015 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On December 31, 2015 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On February 1, 2016 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On March 10, 2016 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

On April 15, 2016 a shipment of bag filters (four cubic yard boxes) from the SEE process treatment system was shipped offsite for non-hazardous disposal.

18. NAPL Reuse

On April 7, 2015 a total of 12,647 gallons of stored NAPL was sent to Mesa Oil for reuse. The analysis showed that 703 gallons of the total fluid was water. The water has been subtracted from the NAPL recovery estimate.

On April 21-22, 2015 a total of 13,076 gallons of stored NAPL was sent to Mesa Oil for reuse. Analysis showed a water content between <1% to 3% or a total of 227 gallons of water. The water removed has been subtracted from the NAPL recovery estimate.

On May 7, 2015 a total of 5,722 gallons of stored NAPL was sent to Mesa Oil for reuse.

On May 21, 2015 a total of 1,400 gallons of stored NAPL was sent to Mesa Oil for reuse.

On June 24, 2015 a total of 6,771 gallons of stored NAPL was sent to Mesa Oil for reuse.

19. Estimated Formation Water Temperature

The estimated formation water temperatures are indicated in Table 6 below. The formation water temperatures have been estimated for each MPE well by measuring the eductor liquid feed and return flow rate together with the eductor liquid feed and return temperatures. The enthalpy increase in the liquid return temperature as compared to the liquid feed stream temperature is used to provide the MPE well specific formation temperature. Estimated formation water temperatures above the boiling point likely indicate that steam is being pulled into the liquid extraction system. These estimated data for each MPE well location are used in conjunction with the extracted vapor data collected at the MPE wells to make determinations on steam breakthrough around the site. All of these data are reviewed holistically (with other site data such as the TMP data) to determine when and where steam cycling events should commence.

The location of each MPE well is also indicated in the table. Since perimeter extraction wells are expected to extract colder water from outside of the treatment zone, the formation temperature at these locations is not expected to reach steam temperatures. Thus, full or partial steam breakthrough can still be occurring at the perimeter locations without the estimated formation water temperature being at boiling. Please note that if the estimated formation water temperature is higher than 220°C for a given well, ">220" is indicated in the table.

Please note that no vapor temperature data were collected from the MPE wellheads November 5-13, 2015 due to issues with the temperature equipment.

Table 6. Estimated Well Formation Temperatures

Well	Well	Required to Reach	Reached Steam	Vapor Extraction	MPE Formation Temperatures																							
	Location	Steam Temperature	Temperature (Calculated)	Max Temperature [°F]	2/19/16 [°F]	2/24/16 [°F]	2/26/16 [°F]	3/1/16 [°F]	3/3/16 [°F]	3/7/16 [°F]	3/9/16 [°F]	3/11/16 [°F]	3/14/16 [°F]	3/16/16 [°F]	3/18/16 [°F]	3/21/16 [°F]	3/24/16 [°F]	3/28/16 [°F]	3/30/16 [°F]	4/1/16 [°F]	4/4/16 [°F]	4/6/16 [°F]	4/8/16 [°F]	4/11/16 [°F]	4/18/16 [°F]	4/20/16 [°F]	4/22/16 [°F]	4/25/16 [°F]	4/27/16 [°F]
CZ07	Perimeter	No	Yes	158	100	>220	8	>220	>220	>220	>220	218	>220	>220	220	208	>220	215	210	194	209	211	198	181	187	192	145	191	183
CZ08	Perimeter	No	Yes	192		>220											192	199	165	181	153	187	192	176	191	184	182	168	190
CZ09	Perimeter	No	Yes	156	86	123	97	186	149	134	125	153	139	177	194	182	142	88								136	162	141	130
CZ10	Perimeter	No	Yes	206	55	186	71	>220	198	186	178	169	187	159	165	161	150	168	144	166	158	156	123	161	155	162	165	134	159
CZ11	Interior	Yes	Yes	217																									
CZ12	Perimeter	No	Yes	220	35	191	212	>220	>220	>220							>220	>220	>220	>220	>220	73	>220	>220	>220	>220	>220	>220	>220
CZ13	Perimeter	No	Yes	160	80	>220	172	>220	>220	>220	>220	213	206	194	189	204	167	192	193	193	196	188	190	182	201	190	213	181	112
CZ14	Perimeter	No	Yes	112		>220		>220	>220	216	>220	206	181	211	200	>220	>220	165	200	174	210	171	199	140	169	179	182	152	172
CZ15	Interior	Yes	Yes	170	116	>220	134	>220	>220	>220	>220	201	137	198	90	196	180	188	177	169	192	183	186	177	183	197	184	160	193
CZ16	Perimeter	No	Yes	212	73	>220	>220	>220	>220	>220	>220	203	>220	>220	>220	185	>220	162	72	107	82	102	98		144	134	142	137	134
CZ17	Perimeter	No	Yes	200	111	209	110	191	>220	219	205	180	197	179	188	170	185	175	184	187	182	173	180	176	203	179	110	157	154
CZ18	Perimeter	No	Yes	208	79	167	93	152	165	142	143	170	120	140	89	132	157	141	88	214	>220				89	>220	121	155	193
CZ19	Perimeter	No	Yes	110	95	198	191	207	219	188	>220	213	207	183	191	178	178	183	111	175	166	166	166	170	166	162	163	169	160
CZ20	Outside CZ	No	No	111	67		88	101	87	86	82	113	86	95	93	94	101	84	88	71	112	88	80	88	91	86	88	89	107
LSZ01	Interior	Yes	Yes	126	80	195	198	191	197	137	170	195	167	195	213		177	175	190	159	162	179	180	214	177	177	188	184	176
LSZ02	Interior	Yes	Yes	130	116	195	66	181	193	188	180	183	168	174	58		177	186	197	>220	167	208	197	>220	207	185	>220	220	201
LZS04	Interior	Yes	Yes	206																									
LSZ05	Interior	Yes	Yes	220	130	>220	77	>220	>220	>220	>220	215	203		>220	170	206	203	195	199	212	213	205	215	210	213	212	200	210
LSZ06	Interior	Yes	Yes	218	177	207	188	177	>220	189	>220	>220	>220	>220	>220	220	190	203	195	>220	>220	202	214	193	220	>220	197	>220	>220
LSZ08	Perimeter	No	Yes	120	82	130	63	122	130	124	138	143	132	108	108	121	126	108	123	111	126	124	120	133	125	104	128	103	103
LSZ11	Perimeter	No	Yes	119		94			97								104	102	99	99	98	106	103	95	132	149	137	136	142
LSZ12	Perimeter	No	Yes	126	97	164	164	126	176	154	180	157	123	157	153	153	156	156	157	144	136	157	147	149	146	156	157	154	152
LSZ13	Interior	Yes	Yes	125	33	178	139	>220	198	133	215	218	202	165	186	219	189	123	173	148	180	>220	187	200	159	152	136	159	144
LSZ14	Perimeter	No	Yes	177	68	207	169	196	185	168	158	143	165	158		138	166	186		163	157	168	156	153	155	187	167	154	149
LSZ15	Interior	Yes	Yes	208	135	210	193	205	202	209	196	202	205	207	203	191	195	162	202	207	191	195	195	201	201	207	130	214	191
LSZ16	Interior	Yes	Yes	205	28		48	205	199	178	170	175	137	155	>220	158	176	162	165	159	165	168	155	159	166	167	177	173	172
LSZ17	Perimeter	No	Yes	220	66	101	68	109	105	98	97	99	98	97	122	94	99	95	91	96	95	97	96	95	90	92	96	96	91
LSZ28	Perimeter	No	Yes	129	76	175	4	176	168	172	148	151	172	155	164	166	144	133	155	159	165	154	151	134	142	146	148	158	149
LSZ29	Perimeter	No	Yes	116	>220	>220	>220	149	194	186	211	215	211	197	217	190	>220	>220	160	>220	209	>220	>220	>220	>220	>220	>220	>220	>220
LSZ30	Interior	Yes	Yes	133		>220	77	>220	>220	218	>220	210	164	>220	>220	197	152	>220	>220	>220	>220	>220	>220	>220	>220	>220	>220	>220	>220
LSZ31	Interior	Yes	Yes	147		91	95	>220	>220	175	185	182	181	>220	173	117	130	100		134	125	74	46		155	178	185	177	178
LSZ32	Interior	Yes	Yes	120		206	186	216	>220	195	>220	>220	214	198	>220	>220	204	>220	>220	202	>220	>220	>220	>220	>220	>220	>220	>220	>220
LSZ33	Perimeter	No	Yes	130	35	>220	197	>220	>220	189	198	197	184	175	202	>220	193	193	190	133	188	183	179	180	196	207	196	191	213
LSZ34	Interior	Yes	Yes	168	47	177	166	183	177	174	168	170	173	163	192	176	187	181	182	173	166	184	170	175	183	168	168	174	172
LSZ35	Perimeter	No	Yes	121	118	110	108	117	112	102	103	108	106	103	108	101	109	103	101	103	103	104	101	102	105	100	110	99	105
LSZ36	Perimeter	No	Yes	128	59	150	145	143	139	139	129	139	101	135	140	142	141	117	138	136	138	137	135	138	140	136	138	132	132
LSZ37	Perimeter	No	Yes	208	76	151	152	174	170	119	152	109	170	102	123	137	123	116	108	103	101	107	103	153					
LSZ38	Perimeter	No	Yes	116	72	157	131	154	148	143	148	144	134	139	142	126	153	143	138	153	141	144	143	128	147	126	128	144	129
LSZ39	Perimeter	No	No	118	18	122		120	116	148	131	124	121	125		137	126	124		133	145	145	121	119			139	109	102
LSZ40	Interior	Yes	Yes	135	113		213	220	>220	210	195	194	188	188	>220	187	187	196	182	202	191	199	196	180	203	209	186	199	195
LSZ42	Perimeter	No	Yes	130	72	179	167	180	177	172	177	128	158	159	172	121	175	192	172	158	162	155	166	119	172	160	168	140	159

MPE Formation Temperatures																											
Well	Well	Required to Reach	Reached Steam	Vapor Extraction	2/19/16	2/24/16	2/26/16	3/1/16	3/3/16	3/7/16	3/9/16	3/11/16	3/14/16	3/16/16	3/18/16	3/21/16	3/24/16	3/28/16	3/30/16	4/1/16	4/4/16	4/6/16	4/8/16	4/11/16	4/18/16	4/20/16	4/22/16	4/25/16	4/27/16
	Location	Steam Temperature	Temperature (Calculated)	Max Temperature [°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]	[°F]
UWBZ01	Interior	Yes	Yes	206	43	193	176	211	188	208	170	174	142	159	151	100	166	201	160	149	152	103	129	134	172	204	214	94	179
UWBZ02	Interior	Yes	Yes	210	138	>220	73	>220	>220	>220	>220	>220	>220	>220	>220	196	>220	>220	>220	>220	159	>220	>220	>220	>220	206	207	198	211
UWBZ04	Interior	Yes	Yes	201	101	>220	146	>220	>220	>220	>220	>220	>220	>220	>220	>220	168	187	192	204	178	197	182	188	196	180	169	189	173
UWBZ05	Interior	Yes	Yes	220	46	>220			>220	210	216	187	166	142	186	156	140	136	127	131	143	129	128	127	129	132	135	124	122
UWBZ06	Interior	Yes	Yes	165	103	165	92	172	178	164	161	165	>220	168	129	106	132	124	112	116	124	116	113	108	112	95	111	96	96
UWBZ10	Perimeter	No	Yes	179	59	>220	89	>220	>220	200	198	172	206	216	196	194	180	172	166	170	163	166	161	148	169	170	173	165	173
UWBZ17	Perimeter	No	Yes	220	25	>220	63	>220	>220	>220	>220	>220	>220	>220	161	207	216	126	177	181	173	172	189	185	177	185	182	185	149
UWBZ18	Interior	Yes	Yes	200	132	>220	95	>220	>220	>220	>220	>220	>220	143	91	>220	>220	>220	206	188	211	188	183	182	185	141	146	181	187
UWBZ19	Perimeter	No	Yes	162	69	201	98	>220	>220	>220	>220	>220	>220	>220	>220	200	183	170	205	154	156	158	166	119	175	151	157	159	151
UWBZ20	Dual Phase - Perimeter	No	No	112		96																							
UWBZ21	Outside UWBZ	No	Yes	118	92	>220	>220	>220	>220	>220	>220	>220	185	214	>220	>220	>220	220	>220	194	187	205	206	208	195	165	191	114	189
UWBZ22	Perimeter	No	Yes	127	>220	192	190	218	>220	>220	190	169	127	96		91	145	147		127	150	106		104	156	152	161	142	149
UWBZ23	Outside UWBZ	No	Yes	206	38	>220	>220	>220	>220	>220	>220	>220	>220	>220	>220	>220	209	220	>220	201	194	>220	194	203	235	197	216	219	>220
UWBZ24	Dual Phase - Perimeter	No	Yes	200	91	218	>220	>220	>220	>220	>220	>220	>220	>220	107	>220	>220	>220	208	220	212	>220	>220	190	205	211	124	202	195
UWBZ26	Outside UWBZ	No	Yes	105		150			167	138	130	133	160	133	137		138	122	122	133	111	137	116	135	137	114	127	154	160
UWBZ27	Outside UWBZ	No	Yes	115	100	166			133	113	114	111	109	114	118	121	113	118	96	136	105	113	96	137	99	99	105	104	103

RED : at or above steam temperature (≥210 °F)
GREEN : below steam temperature (<210 °F)

20. NAPL Screening Results and Calculated Benzene Concentrations

Figures 25-27 below present the screening level results for NAPL detected in samples collected from MPE wells across the site. Screening samples are typically collected on a weekly basis. The figures below also include calculated benzene concentrations of groundwater samples collected from MPE wells across the site.

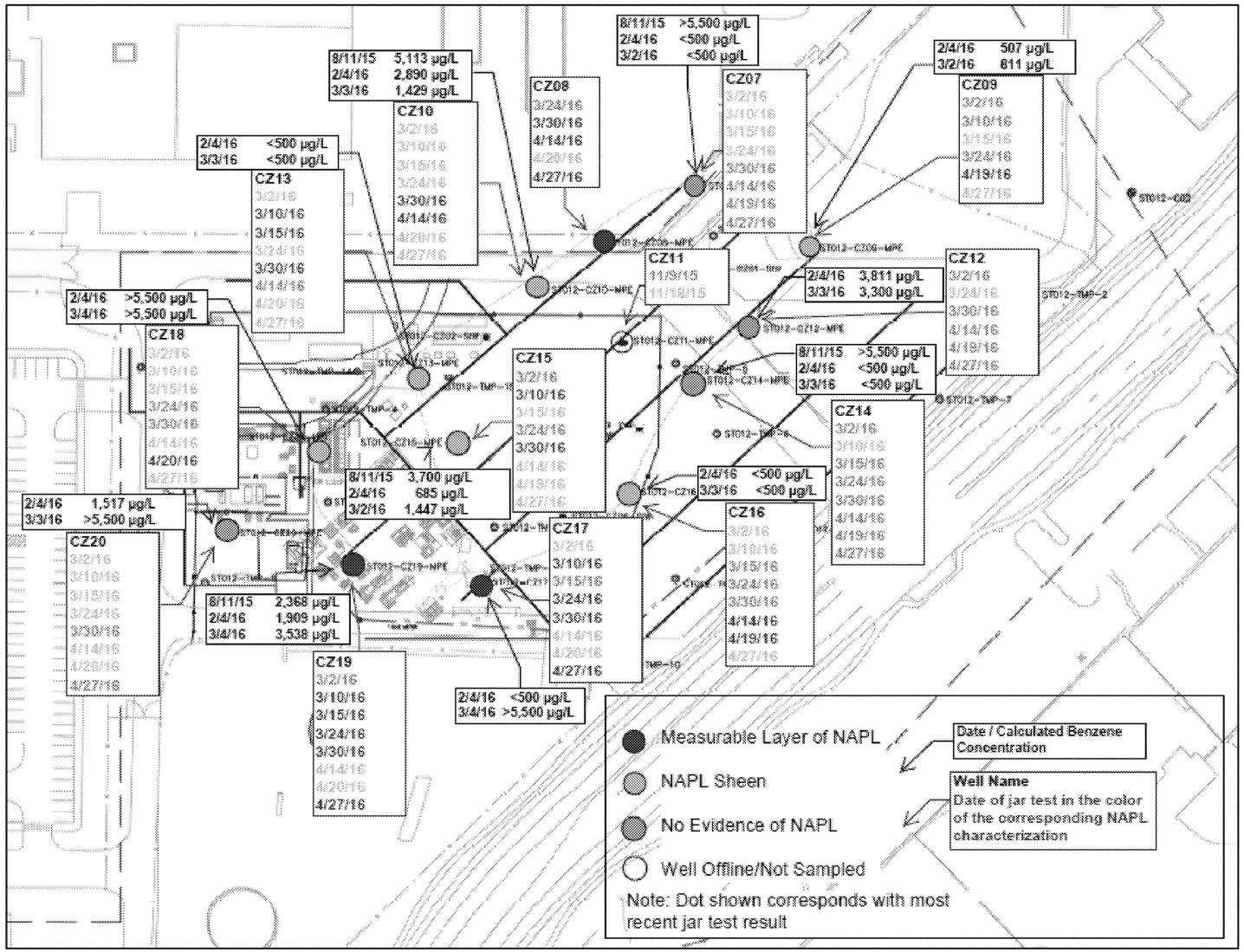

Figure 25. NAPL Screening Results and Calculated Benzene Concentrations – Cobble Zone

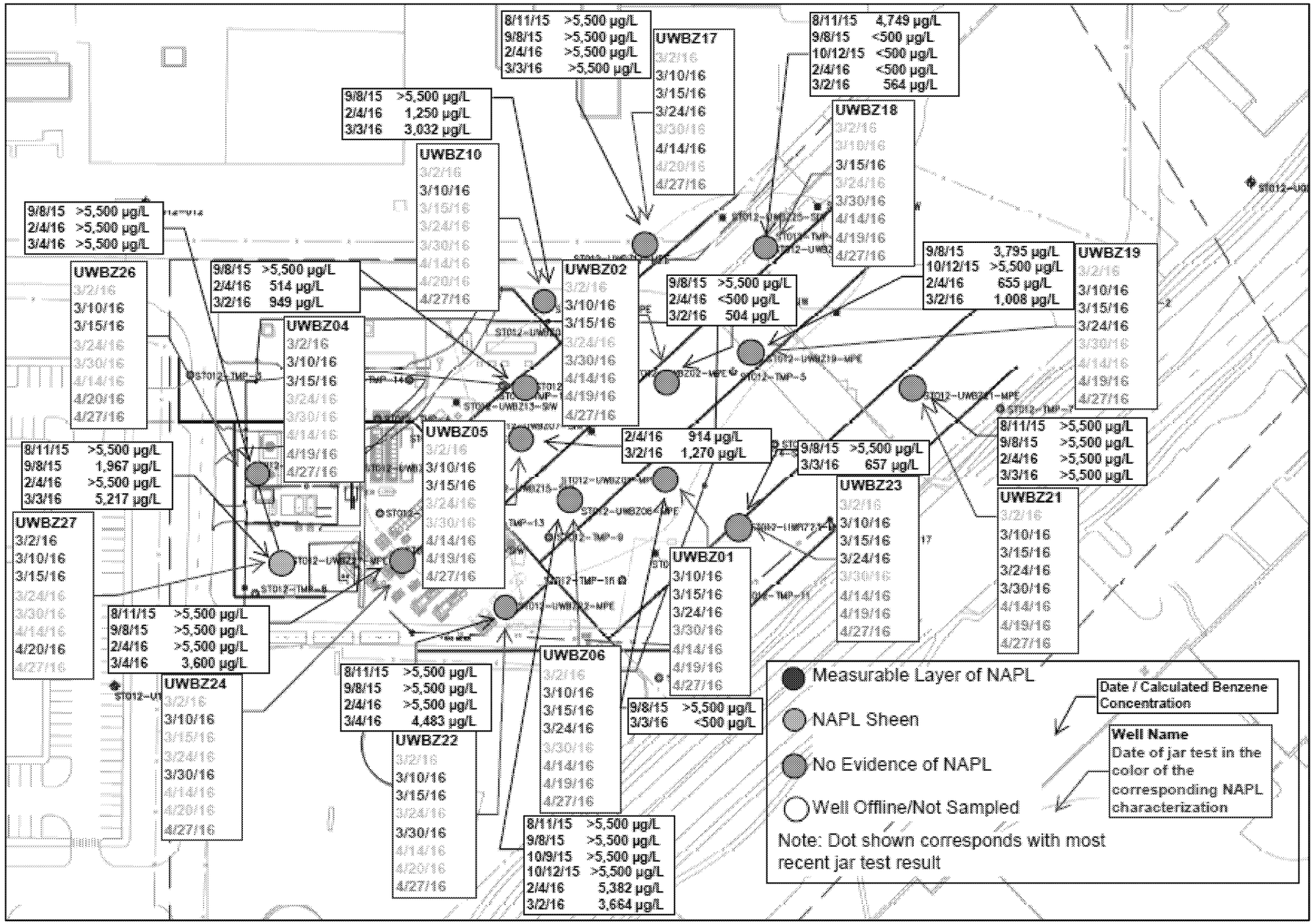

Figure 26. NAPL Screening Results and Calculated Benzene Concentrations – Upper Water Bearing Zone

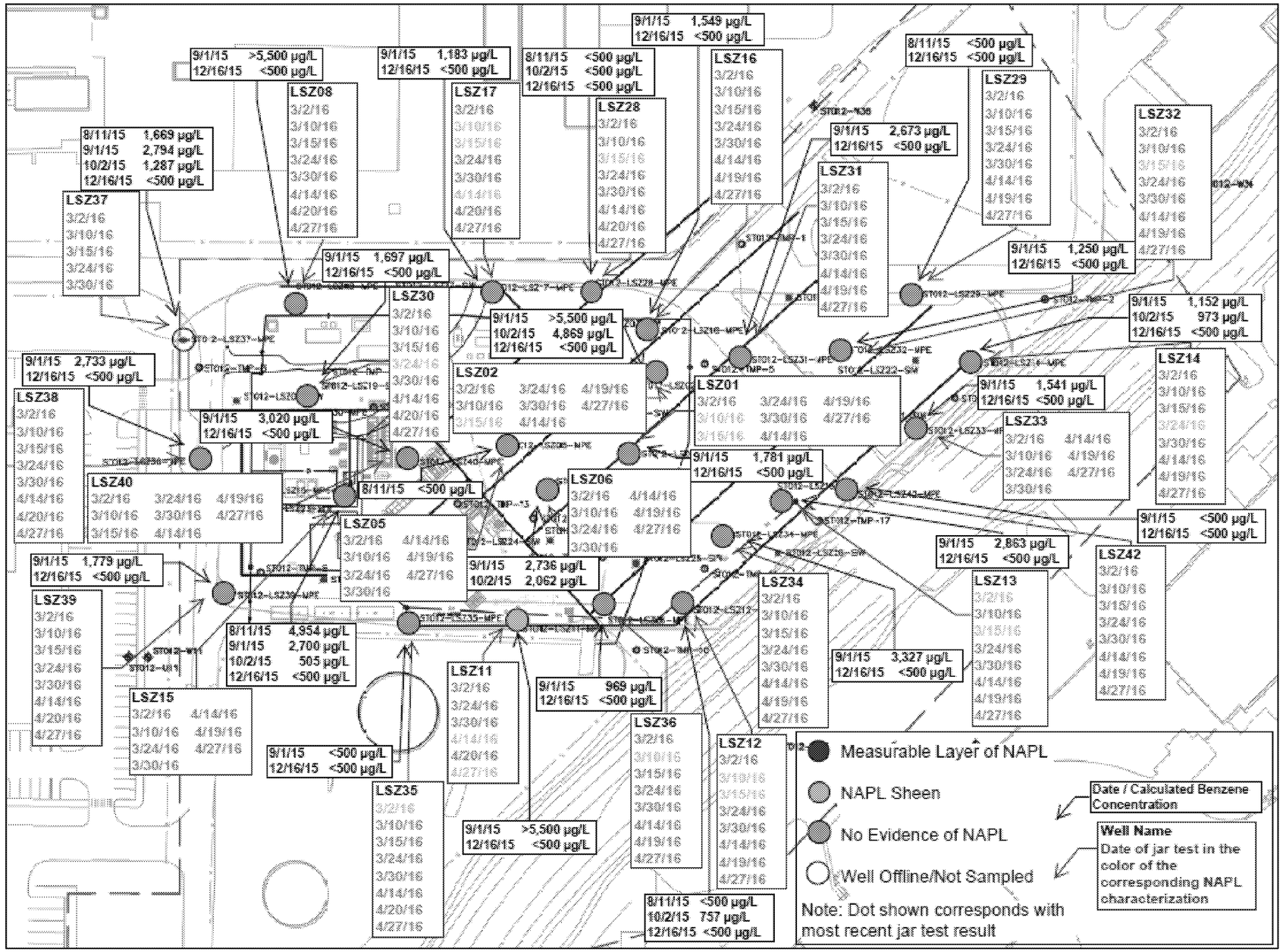

Figure 27. NAPL Screening Results and Calculated Benzene Concentrations – Lower Saturated Zone